CHNOLOGY DEPT.

POPULAR SCIENCE

MONTHLY

ECHANICS AND HANDICRAFT

Wilbur Shaw Previews a

1953 BUICK

PAGE 100

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Making the Most of Your Basement

PAGE 206

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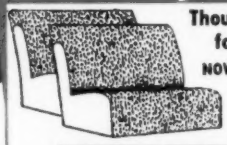

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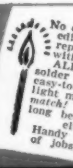

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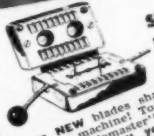

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Mechanics and Handicraft

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America's most widely known sports cartoonist—Tom Paprocki (above) of The Associated Press —teams up with British scientist Prof. A. M. Low to predict what's ahead in sports. For their forecast of the coming age of mechanized athletics, turn to page 97.

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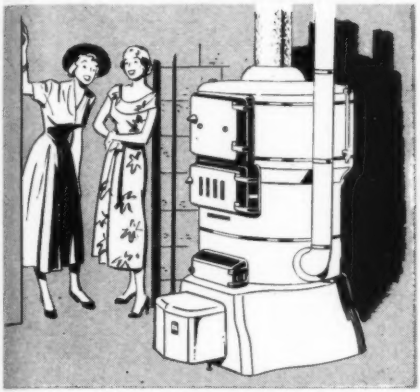

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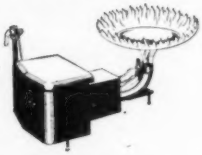

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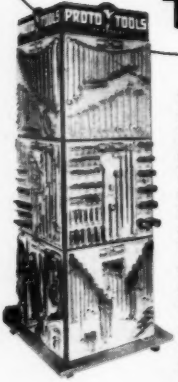

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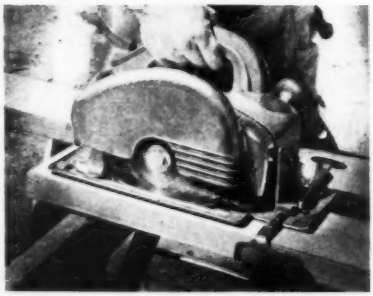
NEXT MONTH . . . .

Using the Portable Saw



It's the tool that is catching the eyes of pro and amateur carpenters alike. Edwin M. Love tells of its "on the job" abilities and gives tips on using and caring for a portable saw in next month's PSM.

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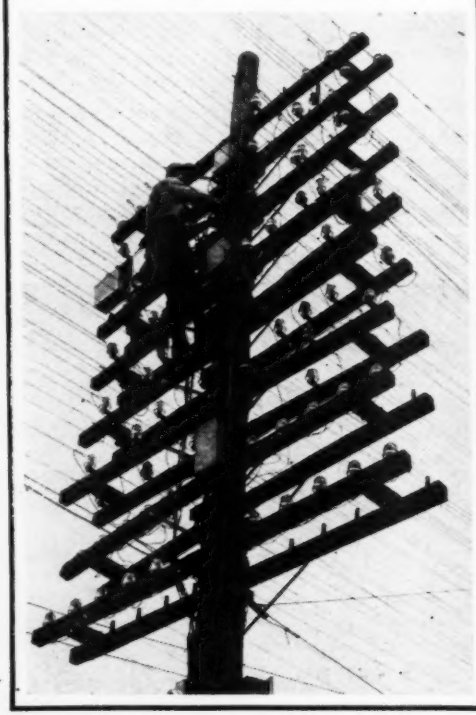
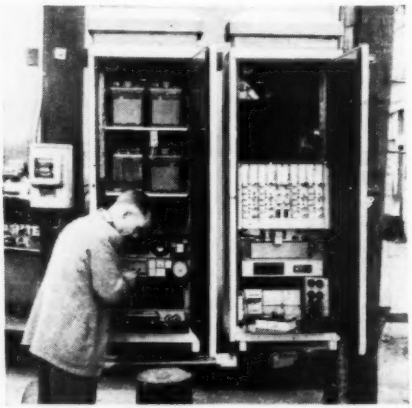


MUCH of your Long Distance telephone system works through cable but open-wire lines are still the most economical in many places. Thousands of these circuits are so short that little would be saved by using elaborate carrier telephone systems which are better suited for long-haul routes. But a new carrier system . . . the Type O designed especially for short hauls . . . is changing the picture. It is economical on lines as short as 15 miles. With Type O thousands of lines will carry as many as 16 conversations apiece.

Type O is a happy combination of many elements, some new, some used in new ways. As a result, terminal equipment takes up one-eighth as much space as before. Little service work is required on location; entire apparatus units can be removed and replaced as easily as vacuum tubes.

Moreover, the new carrier system saves copper by multiplying the usefulness of existing lines. For telephone users it means more service . . . while the cost stays low.



Repeater equipment is mounted at base of pole in cabinet at right, in easy-to-service position. Left-hand cabinet houses emergency power supply. System employs twin-channel technique, transmitting two channels on a single carrier by using upper and lower sidebands. A single oscillator serves two channels.

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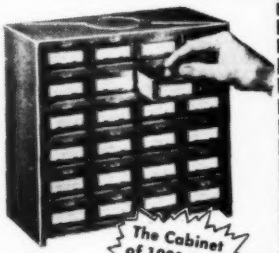

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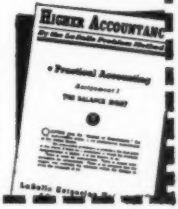

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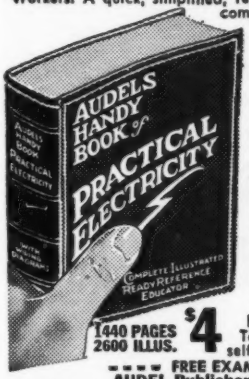

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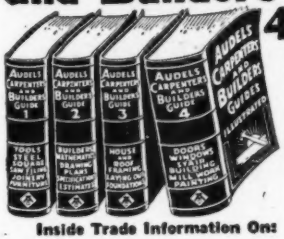

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The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

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Letters

Dept. of Interplanetary Information

I haven't seen a "flying saucer" yet, but I'm keeping my eyes peeled. If I should see some strange object blazing across the sky, what should I do about it?

C. S. Cobber, Elmsford, N. Y.

Take a picture of it if you can. In any case, report what you have seen to the nearest Air Force base. It will help if you give an estimate of the object's speed, altitude and direction of flight.

When the flying saucers were first reported seen over Washington, D. C., a couple months ago, the Air Force ordered its fighters to hunt and shoot them down.

This is a terrible mistake. These visitors can make ships that can fly from faraway planets and weapons that could surely blow up the earth. If we make them mad, they'll destroy us, but if we let them land I'm sure the results will be peaceful.

James Ross, Saginaw, Mich.

I was having dinner one night when I suddenly looked down and noticed two bright objects resembling saucers bobbing up and down in my coffee cup. I realized

then that here on a small scale was the answer to the saucer riddle—a source of light (a ceiling light behind me) and an unstable reflecting surface (the coffee).

I'm sure this is the answer to what all those people have been seeing. Maybe.

Mary A. Pirie, Pensacola, Fla.

Your space scale on page 85 of the August issue should give the 95-pound boy's weight as 95 pounds even on the moon—not 14.5 pounds as shown—because the sign on the scale's face says: "No Springs-Honest Weight." This means that the scale employs a mass-balance system that would automatically compensate for the differences in gravitational force and read 95 pounds on any heavenly body.

J. A. Huseman, Portland, Ore.

The scales had been adjusted by the Hayden Planetarium to show in Earth pounds what a person would weigh on the moon.

Worth Considering

In your article "Which Blowouts Are Worse?" [Aug. '52, p. 159], you seem to conclude that because rear-wheel blowouts are more dangerous drivers should keep their most-worn tires on the front wheels.

This conclusion overlooks the fact that while they may be less dangerous, front-wheel blowouts are more likely to occur since the front wheels generally carry a larger part of the load. For those who seldom carry a heavy rear-wheel load, it might be advisable to put the best tires on the front.

Bernard Rimland, State College, Pa.

TV Shows from Europe?

Will telecasts cross the Atlantic? How? And when?

Alvin Koppers, Baltimore

Engineers believed until recently that TV's extremely short waves went through the electric roof from 60 to 300 miles above our heads like light through a window and got lost in space. But now they have found that very-high-frequency signals can be bounced off the ionosphere and made to land up to 700 miles from where they were transmitted. Nobody is sure yet what bounces the VHF signals back. It may take a few years to find out.

But even now there are several other

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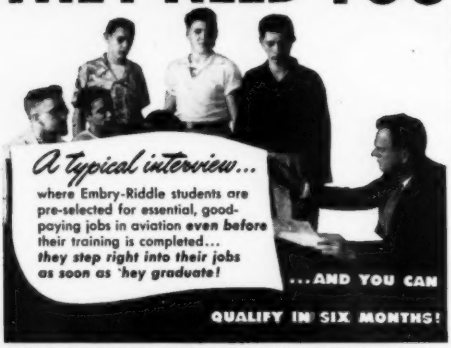

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TRAIN IN MIAMI—AIR CAPITAL OF THE WORLD

methods under study that may make transatlantic TV feasible.

One plan being seriously considered is to build relay stations in Newfoundland, Labrador, Greenland and Iceland, with over-water hops averaging 250 miles between them. Another plan entails a string of ships in a relay line across the ocean. A third proposal is to have the television beam relayed by airplanes flying in circles over the Atlantic at 500-mile intervals and at altitudes between 30,000 and 40,000 feet. That would be practical only for special events—like Queen Elizabeth II's coronation.

Help Wanted

All my life I have wanted to live in a camp in the woods where I could hear the wind howling. Now I have the camp—but there's no wind. It's as silent as a tomb.

A 60-foot tree blew down not 10 feet from my bed and I didn't even know there was a wind blowing.

Can you tell me how I can reconstruct it so the wind will howl and shriek?

HUGH F. KIRKWOOD, Augusta, Me.

Any ideas?

It's the Rule—Not the Exception

I disagree with Wilbur Shaw's statement in the August issue [p. 100] that the Rolls-Royce is the only car from which you could expect 90,000 to 100,000 miles without a piston-ring job.

I have personally seen three cars with over 100,000 miles which have never had the cylinder head or crankcase removed. These cars were still running well, using no oil, and carrying good oil pressure.

EDWARD MAGNUSON, Grantsburg, Wis.

Individual cars occasionally run up performance records such as you mention, but Mr. Shaw's statement was that the Rolls-Royce was the only make of car from which you could expect 90,000 to 100,000 miles on every automobile produced. That's quite a difference.

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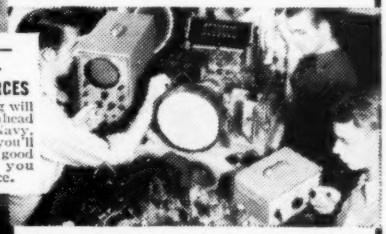

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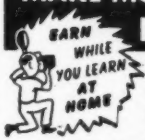

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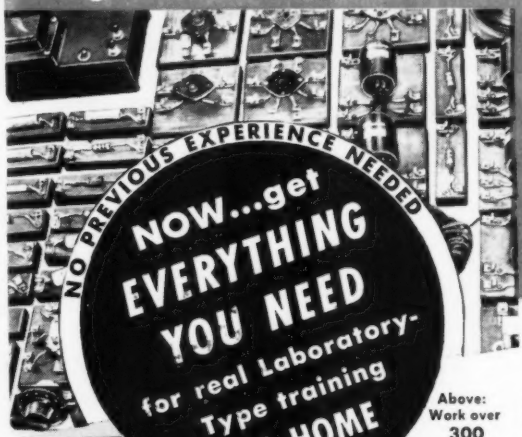

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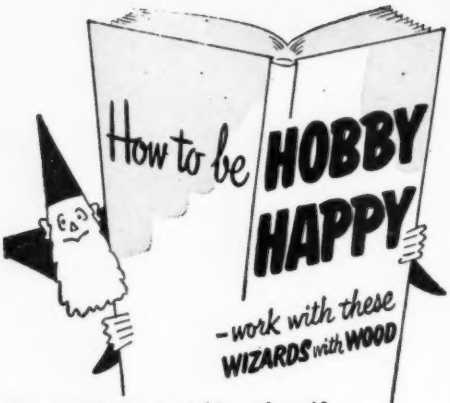

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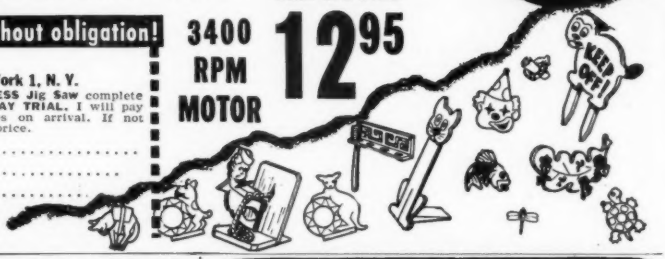

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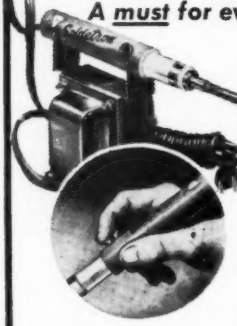

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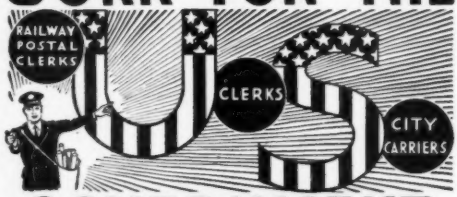

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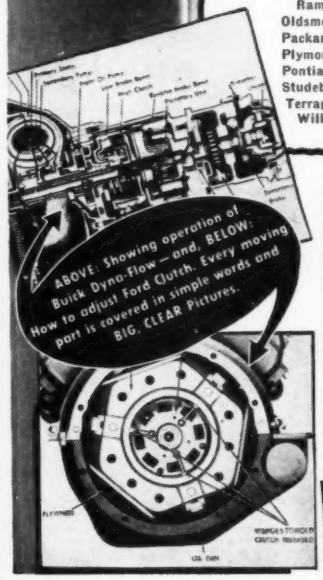

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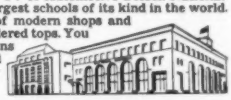

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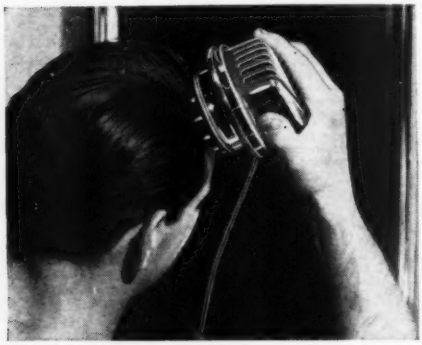

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700-16	6.45	760-15	5.85	750-15	14.05	900-20	17.35
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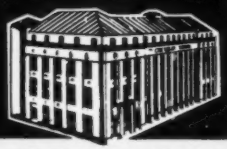

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New Co-op Economy Club May Save Millions for Nation's Motorists.....

OVER ½ MILLION MEMBERS PAY NO DUES OR FEES...ENJOY ALL CLUB BENEFITS

By Raymond J. Carpenter

LOS ANGELES, August 20 (GEC)—Less than 22 months ago a group of Los Angeles wholesalers started a new, cooperative Auto Economy Club. These businessmen believed that it would be mutually profitable to share their earnings with the car owners and householders of the nation. Now, in less than two years, the Gane Economy Club boasts of a membership in excess of half a million and it is continuing to grow like wildfire. Car owners from every state in the union, from Canada and most U. S. territories are saving thousands of dollars by using club recommended economy methods and special club discount privileges on both automotive and household products.

Why the Economy Club Was Formed

The businessmen who founded the GE Club realized that if they could develop a following of loyal, cooperative club members they could: 1. Eliminate the middleman. 2. Do away with product advertising expense (in today's economy it costs more to sell a product than to manufacture it). 3. Cut merchandise costs greatly by buying in greater volume.

Why the GE Club Is Sweeping the Nation

Since thousands of dollars are saved through club cooperative buying and selling, this profit is shared with club members in the following ways: 1. Members can buy hundreds of outstanding automotive and household products at discounts ranging from 10% to 40%.

2. Members get a free full year's subscription to the "Economy News," big club magazine. This magazine features:

A. Hundreds of pictures and descriptions of new, tested products for your car and home ... all at big club discounts.

B. Stories and technical information from leading national sources on such subjects as: **"How To Increase The Re-Sale Value Of Your Car"; "How To Get Up To 42 Miles Per Gallon From Any Car"; "How To Beat The Auto Repair Racket"; "How To Drive 16,000 Miles Without Changing Oil."**

3. As a new club member you can start at once to enjoy special "Buy Without Money Privileges." This plan allows members to get absolutely cost free their choice of hundreds of items listed in club catalogs.

Club Membership Is Open to All

The many benefits of this giant new cooperative club are available to anyone who drives a car. Members are from every walk in life: housewives, business men, secretaries, tradesmen, etc. All have the same opportunity to share the auto economy secrets developed through club research and money saving benefits made possible by club volume purchases.

Club Can Benefit 50 Million Motorists

Club officials estimate that a five million club membership will be reached within the next 24 to 36 months and will continue to expand and grow.

'Buy Without Money Plan' Amazes Club Members

It's hard to believe, but it's true . . . any club member can buy any or all the hundreds of items shown in the club magazine and in club merchandise catalogs without paying one red cent. This revolutionary merchandising plan gives all club members the opportunity to save hundreds of dollars if they wish by merely HELPING GET NEW, QUALIFIED CLUB MEMBERS. It's easy . . . you don't buy or sell anything . . . you just invite your friends to join the club and share its many benefits.

Shown here: Club Surprise Package of credit checks, certificates and money saving coupons sent free to all new member's.

A "Cost Free" Club

Though Club members can save many, many dollars through special club discounts, they are required to pay no dues or fees of any kind. After making the club's registration deposit a club member can enjoy all club benefits thereafter without ever paying one solitary cent. (The $1 deposit will be refunded upon the return of the membership card and the new member "surprise" package complete.)

Club Life Membership Card Is Yours for the Asking

The official Gane Economy Club membership card shown here will be *issued, registered* in your name and sent to you *postpaid* in the big, valuable New Member's Surprise Package as soon as your registration deposit is received. WRITE TODAY!

This photograph shows just a few of the hundreds of automotive parts and accessories available to Economy Club members at big discounts. Club's amazing "Buy Without Money Plan" enables members to buy any or all items in club catalogs without spending one cent.

How Club Members Save Money Through Special Discount and Gift Offers

All new Economy Club members receive a big club "Surprise Package" along with their life membership card. This package contains FREE Gas Coupon, FREE Credit Checks, FREE Credit Memorandum, FREE Gift Certificates, FREE Money-Saving-Coupons, FREE Trial and Premium offers.

FREE GAS COUPONS—This special Economy Club coupon may be used the same as cash in purchasing gas at your favorite service station. Station owners then may use these coupons to buy merchandise from the club wholesale department.

FREE CREDIT CHECKS — Credit checks, Credit memorandums, money saving coupons and discount certificates ranging from $1 to $12 in value can be used the same as cash in purchasing many outstanding automotive and household items.

FREE TRIAL OFFERS—Club officials have arranged for many household and automotive products to be sent (pay no deposit, pay postman nothing) to club members *cost free* so that they can "Try Before They Buy."

Memberships Issued "On Approval" Only

When your membership card and Club Surprise Package arrive, browse through its fascinating contents at your leisure. Read the "Economy News," the club magazine, and other interesting material. Examine the valuable credit checks, money saving coupons and free trial certificates. Then, if you do not believe that the club offers you a great opportunity . . give up your membership by returning the complete package within 10 days AND YOUR REGISTRATION DEPOSIT WILL BE PROMPTLY RETURNED

CLUB MEMBERS SAY:

***MR. J.K.H., NEWARK, NEW JERSEY, SAYS:** "I think your discount club is the greatest thing since television. I want memberships for my two brothers, as I figure I've saved about $13 on auto accessories already."*

***MRS. HARRY L.S., PROVO, UTAH, SAYS:** "Your 20% discount on household items has sold me on buying most of my Christmas presents through the club."*

***MR. ALBERT R.E., FORT WORTH, TEXAS, SAYS:** "Don't know how you do it...your Economy Club deal is the best $1 value I've ever seen."*

OFFICIAL CLUB APPLICATION FORM

GANE ECONOMY CLUB, DEPT. CP-10
6238 Wilshire Blvd., Los Angeles 48, Calif.

Gentlemen: Please send me my surprise package and club membership card entitling me to all club discount privileges and benefits.

I enclose $1 (cash, check, stamps, or money order) to cover the registration deposit.

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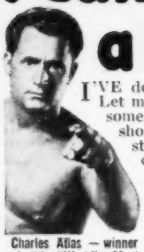

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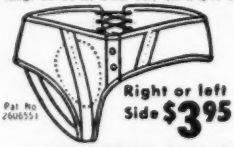

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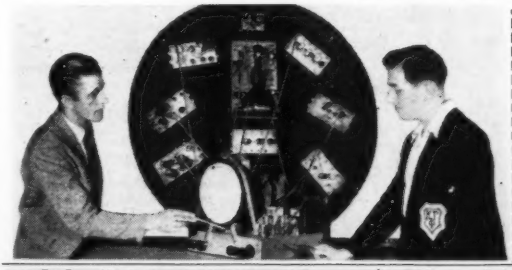

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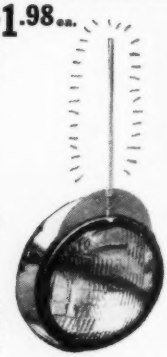

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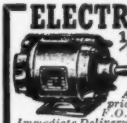

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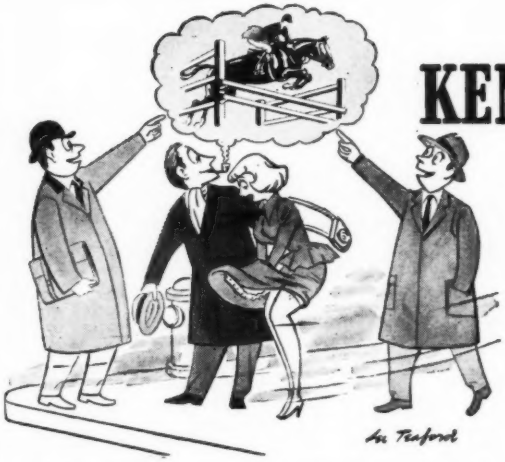

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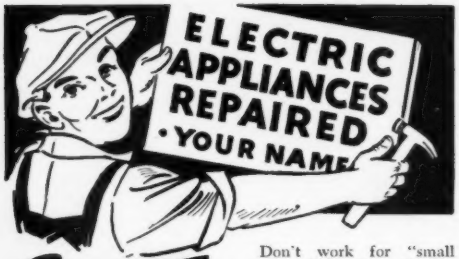

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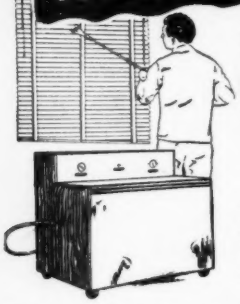

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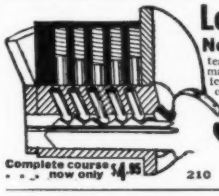

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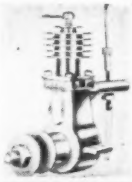

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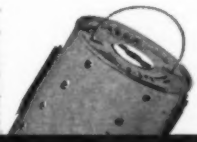

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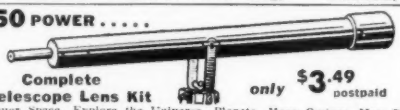

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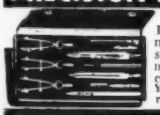

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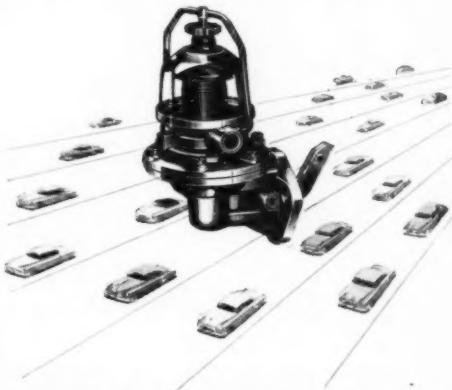

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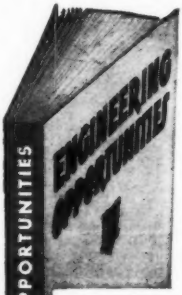

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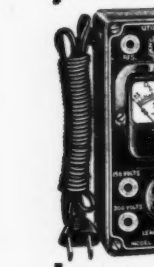

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750-16	9.78	760-15	6.08	750-15	19.08	900-20	17.28
525-18	5.08	800-15	6.58	825-15	22.18	1000-20	17.88
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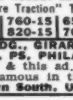

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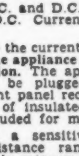

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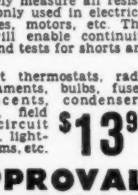

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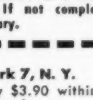

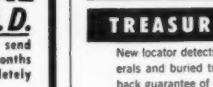

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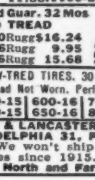

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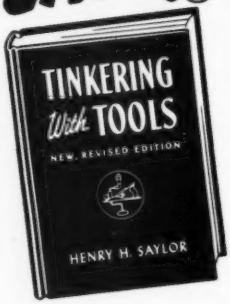

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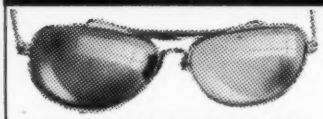

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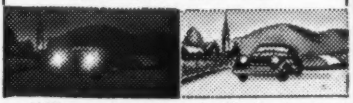

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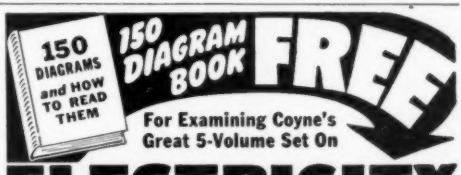

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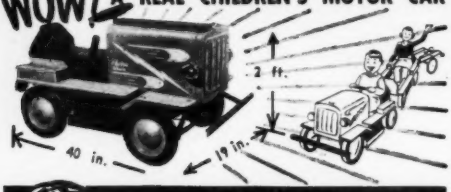

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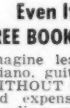

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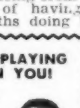

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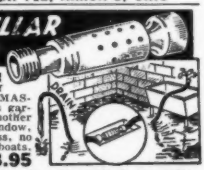

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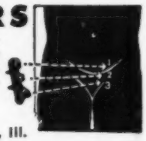

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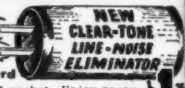

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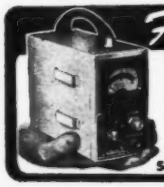

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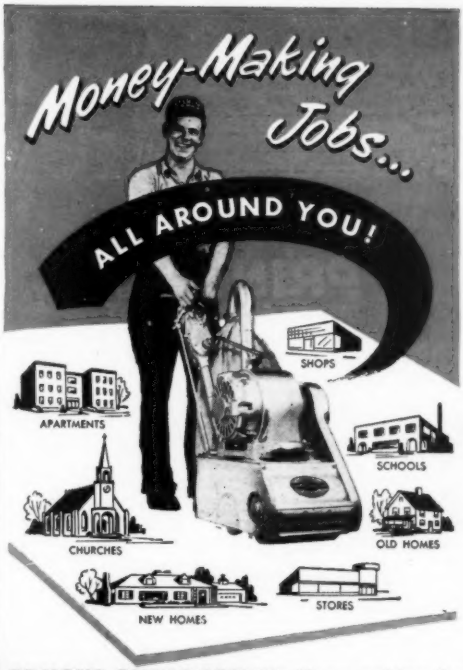

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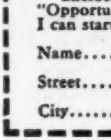

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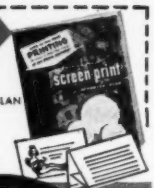

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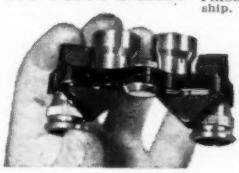

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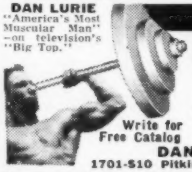

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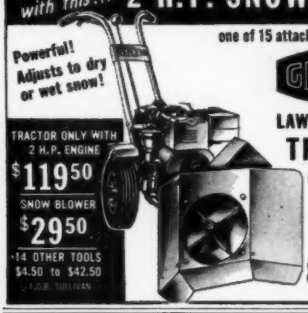

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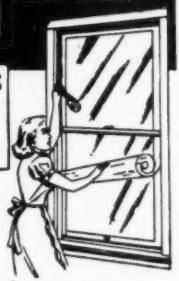

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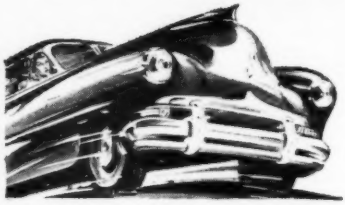

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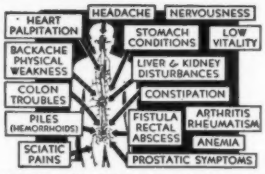

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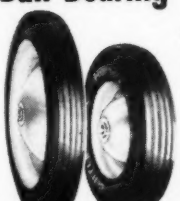

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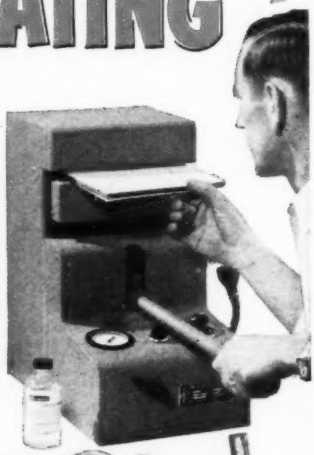

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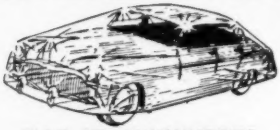

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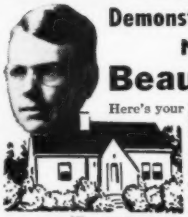

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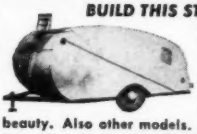

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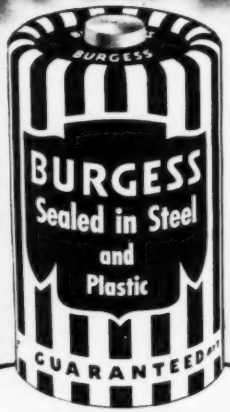

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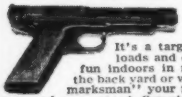

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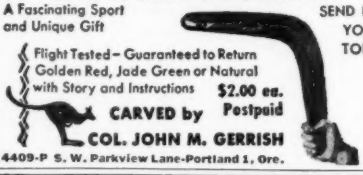

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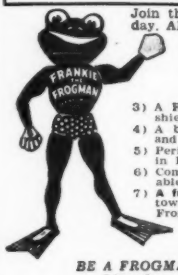

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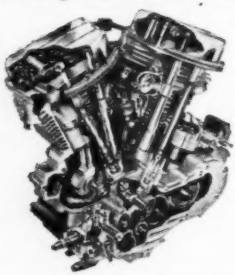

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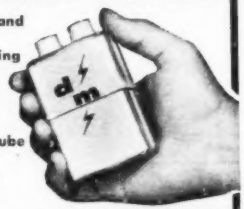

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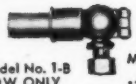

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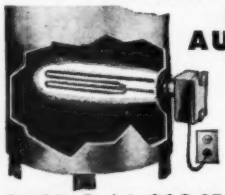

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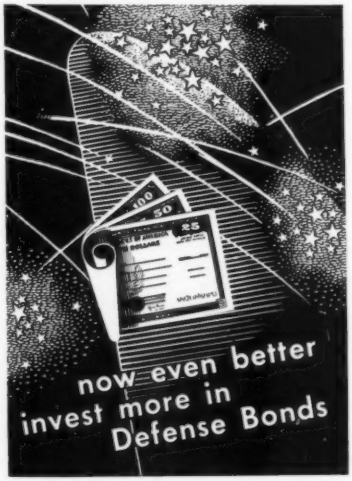

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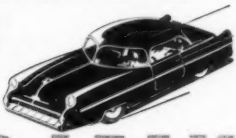

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Prevents trouble-making rust accumulation in cooling system . . . also lubricates water pump.

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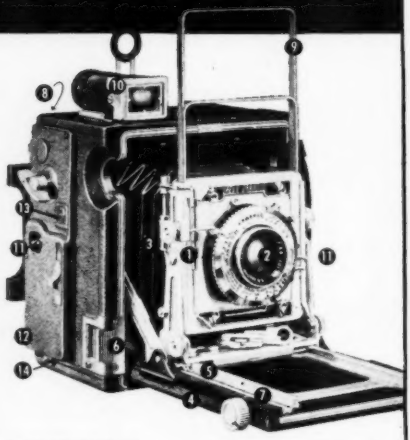

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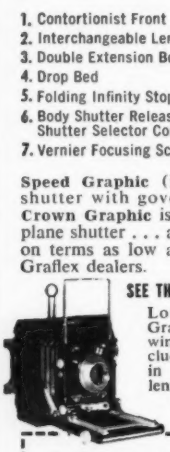

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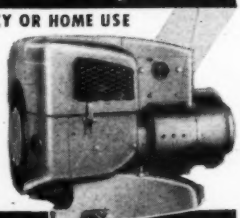

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"I've used every kind of shotgun, but this H&R is the first bolt action I've ever been able to hit targets consistently with! That Sighting Dome makes the Gamester sight like my expensive guns; the Vari-Choke gives a really fine pattern."

H&R "Gamester" DELUXE

MODEL 349 · 12 or 16 gauge

3-Shot Tubular Action Repeating Shotgun

Now every discriminating shooter can have bolt action shotgun economy with superb shooting performance! **$33.95**

Smartly appointed with Monte Carlo stock; fluted comb; forestock finger grooves; rubber recoil pad. Perfect balance, fast, easy handling. See it at your dealer's!

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H&R "VARI-CHOKE"

9 different degrees of chokes, cylinder bore to full, with a simple twist! Spring tension keeps choke set. Settings visible for easy reading. Positive stops at both extremes prevent over-choking.

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Here is a really great advance in sighting accuracy for bolt action shotguns. The Mulno Sighting Dome raises your sighting line above confusion with absolute accuracy guaranteed. Demountable.

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MECHANICAL SPORTS ARE COMING

Radar umps, foulproof boxers, motionless dancers and competing machines are forecast by a noted scientist . . .

Prof. A. M. Low

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THERE is no sport to which science could not make further contributions in the interests of fair play. The various devices used today in athletics have been taken from the "scientific sports": electrical timing strips, photo finishes and automatic starting were all introduced by motor racing and aviation.

Sport will inevitably become more sci-

We may see starting blocks in which the runner's heels are electrically locked until

entifically technical, more mechanized and less a matter of chance.

The camera, now extensively used for deciding the winner of a race, will be brought into use for giving decisions in other sports where it is considered that the human eye is too easily deceived. It is now possible to produce a photograph that can be examined in a matter of seconds from the finish of a race, and the future rules for football or boxing may demand that a continuous photographic record is made of the contest so that any decision which is challenged can be decided by the camera.

Once it is admitted that it is important to avoid an error in placing men an inch apart at the end of a race, it is essential to decide whether they started at the same moment. The present method of starting is nearly as crude as the old method of timing. We may see "starting blocks" in which the runner's heels are electrically locked until the starting gun is fired so that any possibility of "beating the gun" is avoided.

Already, there are miniature attachments for players and runners who can receive instructions while an event is in progress.

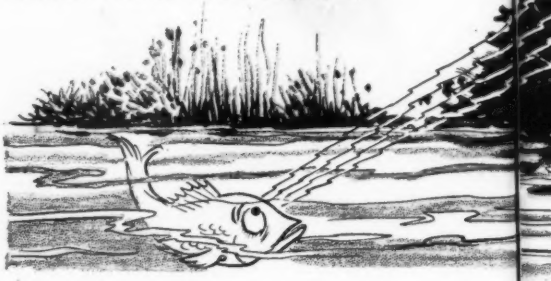
Boxers Will Be Wired

In boxing an electrical machine could register those blows struck below the belt which cause so many disputes. There would be no difficulty in producing such a device and it would not encumber the boxers.

Professional boxing is a sometimes dangerous sport against which educated people will probably revolt. It will be quite simple for scientists to save the sport from extinction and make it much more dependent upon skill. The boxers will have to wear special

THE AUTHOR of this forecast of what's ahead in sports, Prof. A. M. Low, is a distinguished British scientist, inventor and popular writer with an amazing record of making predictions that come true. Twenty-five years ago his first book, *The Future,* accurately foretold the coming of television, radar, 600-m.p.h. planes, and many other developments now accepted as commonplace. The article on these pages is from his latest book, *What's the World Coming To?*, published in this country by J. B. Lippincott Co.

Electronics can be used to detect fish.



the starting gun is fired.

light clothing in which electrical contacts will be concealed. Every blow received will be registered and will be flashed to a board so that the spectators can follow the progress of the fight.

Thus boxing would follow the development of fencing which, from an art concerned with running an opponent through in battle or a duel, has become a blameless sport in which recording methods are becoming quite popular.

Radar-type apparatus may one day come to be used for controlling ball games. It would not be difficult to provide an invisible "net" that would decide whether a ball in baseball was good or not.

To what lengths the glorification of professional sport will be carried is difficult to forecast. Rapid transport makes it possible to consider "world championships." The tendency is toward a world league.

In the last few decades there has been an enormous increase of public interest in motor racing of various kinds, a sport which is "useful" in a way that cricket and football could never be. Many of the major improvements in cars and motorcycles, such as supercharging, overhead valves and improved fuels, have come as a result of racing and record breaking. The success of a dirt-track rider depends to some extent on his

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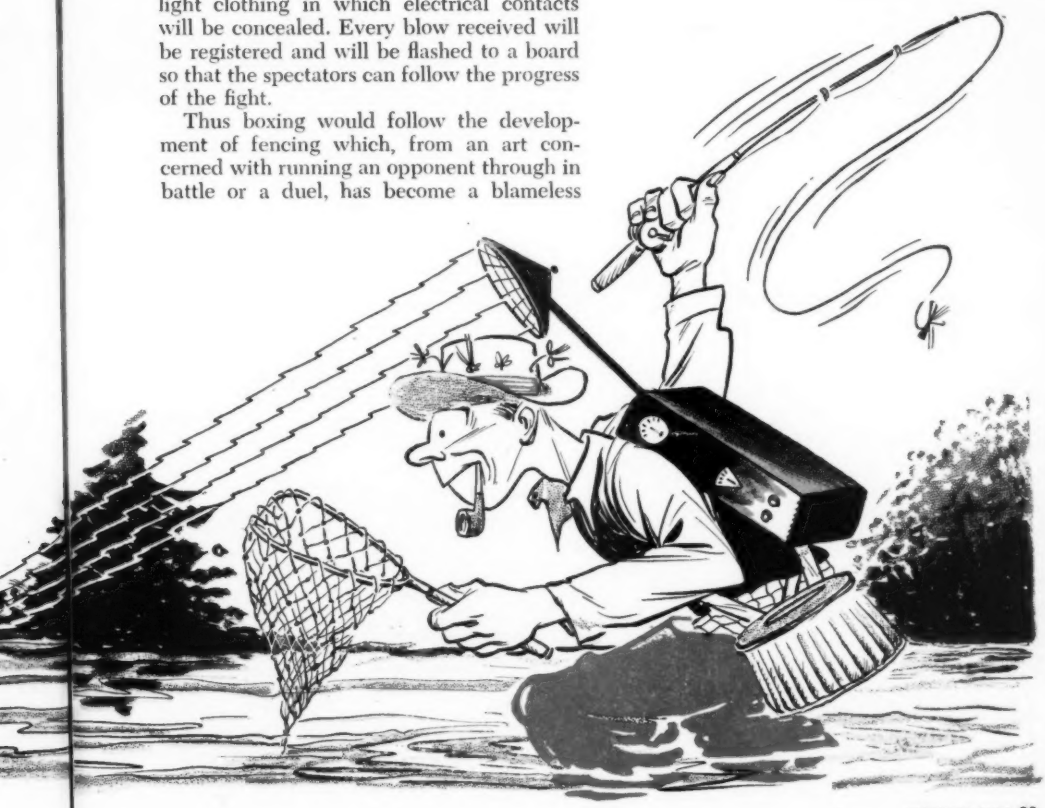


REPORT FROM THE

DRIVER'S SEAT...

Wilbur Shaw Reports:

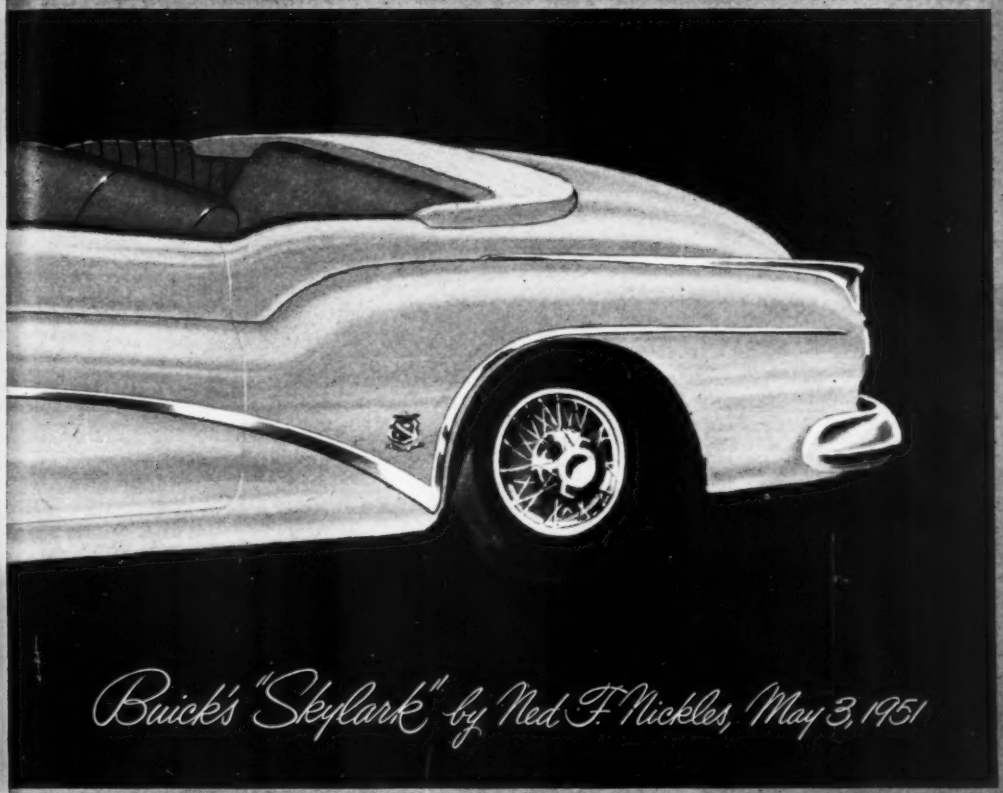
Buick Sets New

BUICK has a really hot one coming up —the Skylark. It's the first truly original-looking American convertible since the late Thirties. I think it will launch a brand-new style trend in U.S. car design.

The minute I saw it I said to myself, "There's a sports-car bug behind this job." And I tracked him down. But first let me tell you how this new convertible with the foreign flavor looks and how it feels to drive.

The Skylark I drove is not exactly like the ones that a few lucky sons-a-guns with five or six thousand bucks in their jeans are probably going to be able to buy sometime next year. I took the hand-built pilot model out for a spin. There'll be some changes made.

The pilot model has a white body with red leather upholstery and a white nylon top. It has a 1952 Roadmaster chassis powered by Buick's 170-horsepower, over-



Style for 1953

ONLY MINOR CHANGES were made to transiate preliminary sketch into car I drove (below).

IT WAS FASCINATING TO ME to see how simply, and yet effectively, the 1952 Roadmaster body design was altered to give the pilot-model Skylark its sports-car look. Lowering the body an inch and a half was one of the important changes. Arrows above point out a few others.

head-valve Fireball eight. What it will have if it goes into production is still a well kept secret. I'm going to make a guess or two —but later on.

Only a few changes have been made in the original Roadmaster body design. But what a whale of a difference those few changes make!

The change that first catches your eye is in the doors. They have been cut down three inches, and their tops follow the slope of the fender line. This single change gives the car European dash. It also makes the rear end look slightly hunched forward, like the rear of a racing car.

Next you notice the wheels—for two reasons. One, they are Rudge wire wheels, which all sports-car fans are nuts about. Two, the fenders have been cut out to show them off fully.

These particular wheels came from a little old shop up a back alley in Italy. They cost $150 apiece and took six and a half months to get.

If the Skylark goes into production, it will almost certainly have American-made wire wheels. They have larger, much shorter spokes than those on the Italian wheels, but they are good-looking, and they are more rugged and a lot less expensive than the imports.

Comfortable Cockpit

The backs of the Skylark's front seats are shorter than those in a conventional convertible. Their tops are flush with the tops of the doors. I liked this as soon as I slid under the steering wheel. My seat gave me all the support I wanted where I needed it, but left me with a good, free-and-easy feeling about my shoulders.

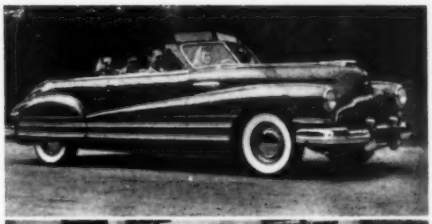
The Skylark has a chummy little cockpit. For once you feel as if the people in the front seats and the people in the back seat are in the same car. The back seat, though lower than normal, is a little higher than the front ones. Whoever is sitting back there has a clear view of the instrument panel which is chrome-plated all the way across. He can also easily talk to the people in front without having to lean forward and hang over their shoulders.

I felt right at home with the bright red, narrow-pleated cowhide that covers the seats and side panels. I had the same kind of upholstery in my racing car in 1937, and I still think it's beautiful. The carpeting is red, too. It's a special needlepoint vulcanized to a sponge-rubber base.

What Would a More Powerful Engine Do?

The whole car has been lowered an inch and a half below the 1952 level. That's all to the good. Actually, there is no real point in having cars as high as they are. The Skylark was let down by shortening its springs. That makes it look racier. It also lets you feel the expansion joints in the road as you cross them. But that's intentional. This is no old matron's automobile. There's a continental crispness in the ride it gives you. That's what the sports-car boys love.

I took the Skylark up to 85 without any trouble, and that got me to wondering what it would be capable of with a more powerful engine. I feel sure it's going to have one. Buicks have had valve-in-head engines for 50 years, and their straight eights have been

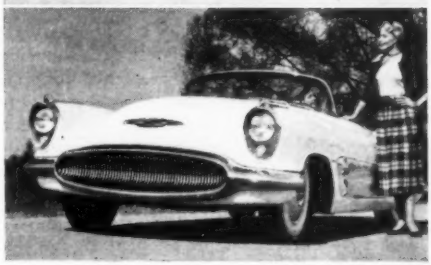


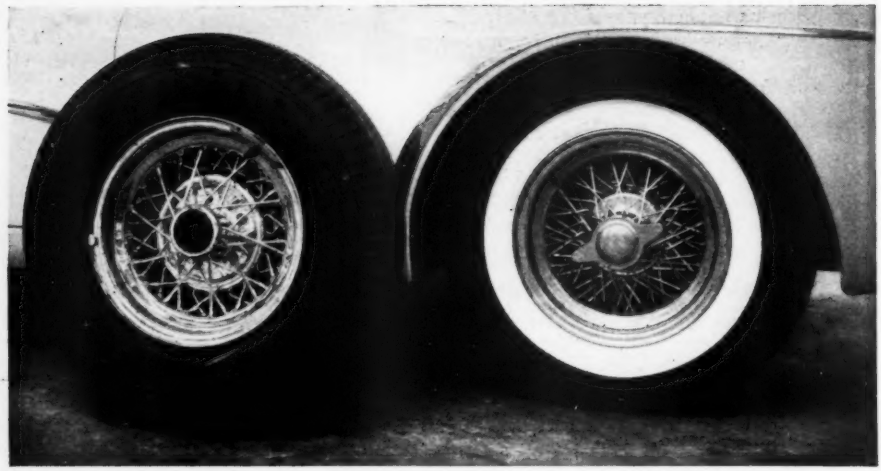
"BUICK WAS THE FIRST American car to 'marry' the front fender to the back one," Ivan Wiles told me. "Our taper-through fender line made its debut in 1942." That's the model at top above. "Now we're the first to divorce the convertible from the two-door sedan," he continued. "Except for the tops, they've had the same contours up to now, you know."

Lower picture above is another view of the Skylark. Note how natural it was to taper the doors and thus parallel that fender line.

EXPERIMENTAL BUICKS have a way of developing into production-line models. The top picture below is of a "dream car" that Buick built in 1939. Today's Roadmasters nearly duplicate it in all details except the fender line.

The bottom picture below shows the ultramodern front end of Buick's XP-300, built as an experiment in 1950. If the company uses its flatter, shorter V-8 engine in the 1953 line, the Skylark may go into production as almost a dead ringer for the XP-300.





ITALIAN-MADE WIRE WHEELS now on the Skylark will probably be replaced by American-built type shown leaning against the car above. It looks better in motion and costs a lot less.

developed to such a high degree that the Buick people probably hate to give them up. But their engineers for four years have been showing what outstanding V-8 engines they can produce. The one they built for the XP-300, for instance, has a compression ratio of 10 to 1 and was designed to develop 300 horsepower. Actually, it pulled as much as 335 on the dynamometer.

The more powerful an engine is, the more power it loses internally, unless at the same time it is made shorter and stiffer This calls for a V-8 engine, which has the additional advantage of being flatter.

So I'll bet you that Buick will modify its experimental V-8 engine for the Skylark, relieving the pressures and cutting back the horsepower to around 180.

Then, with a flatter, shorter engine, the Skylark could be made to look even more unconventional. It would show a closer resemblance to the experimental XP-300.

Shorter Wheelbase with V-8 Engine

Because the V-8 engine is shorter than a straight eight, the Skylark's seats could be moved forward, or its wheelbase shortened, or both. A shorter wheelbase would make the car lighter and easier to park. Moving the seats forward would make the car more comfortable, because passengers would be sitting nearer to the center.

I told you that I guessed there was a sports-car bug at the bottom of the Skylark. He turned out to be Ned F. Nickles, the big, rangy, Wisconsin-born head of Buick's design studio. Ned has owned three MGs—two of the TD series and one TC—and a Siata. The Siata nearly gave him sciatica. He drove 600 miles in it once, all the while sitting in a pool of rain water, and had to stop at 17 garages in the course of the trip. That, as much as anything, convinced him that foreign cars are better to look at than to drive. He's still wild about their lines, though, and feels strongly that lots of Americans would love to own a car that com-

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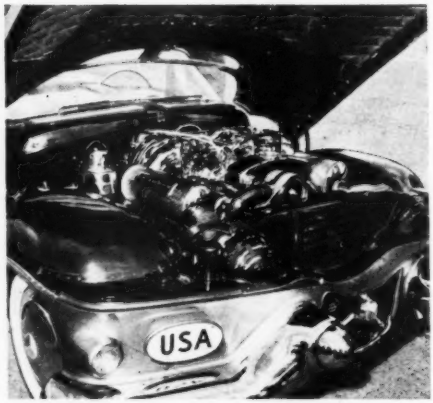


I'LL BET BUICK'S ENGINEERS will modify the 90-degree V-8, 300-horsepower engine they built for the XP-300 and Le Sabre (above) and use it in the Skylark, hinging the hood like this.

Air conditioning made this 25° difference outside and inside a car on a hot summer day.

1953 Cars Will Have Built-In Air Conditioning

When an egg will fry on the hood, you'll be comfortable inside—cooled, ventilated and dehumidified by a small box in your trunk.

By Devon Francis

IT WAS a boiling-hot day. The temperature in the sun was 100°. Inside the car, which had been standing for 10 minutes with the windows closed, it was 115°.

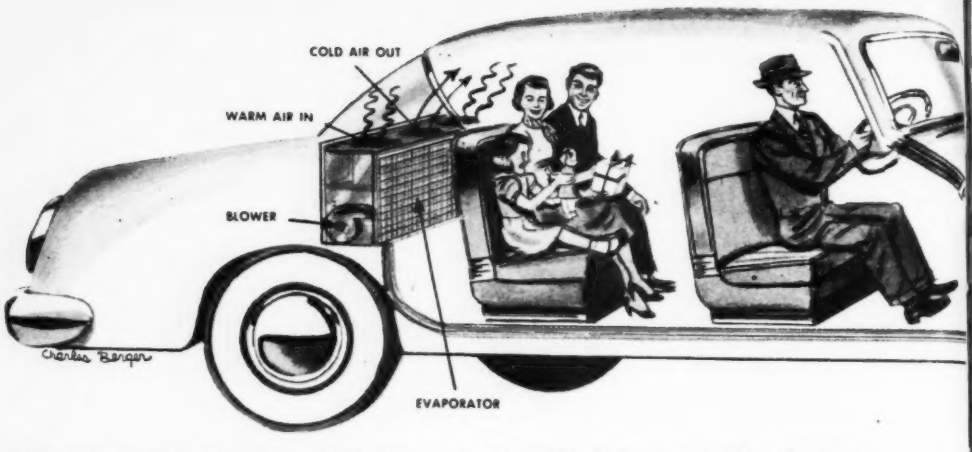
As I slid into the right side of the front seat, alongside a refrigeration engineer, my light summer suit was soaked with sweat.

Then we began to roll. Within a city block the thermometer reading was less than 100°. In two blocks it was 80°-plus; in four, 75°.

This was a preview of automobile air conditioning—perhaps the same kind you will be able to buy in at least two 1953 cars next summer.

Once the car was cool, a blower running at only half-speed kept it that way. It stayed cool during a 10-minute stop in the hot sun with the engine idling.

The system not only cools the car. It also



HOW SYSTEM MIGHT WORK on a 1953 car is shown above. Total weight probably will be less than 200 lb. It will take about five horsepower to run it at top speed, less than one

takes the moisture out of the air. Besides the engineer and me, there were two other passengers in the car. Three of us were smoking. Yet the air was clear and dry.

Air-conditioning automobiles is like air-conditioning railway coaches and produce trucks. You compress gas. Usually it's dichlorodifluoromethane, known commercially as Freon 12. Then you cool it. That liquefies it. Then you squirt it out, releasing the pressure. When the pressure is released, the Freon borrows heat from its surroundings to become gas again. Ergo: refrigeration.

It Has to Be Small

But air-conditioning an auto is more difficult than air-conditioning a railway car, as engineers of the Chrysler Corp. will tell you.

It was a Chrysler experimental car that I rode in. The company isn't ready to say when it will offer air conditioning for its cars, but General Motors has announced that such systems will be available at extra cost on Cadillacs and Oldsmobiles in 1953. It's a good bet that Chrysler—and Lincoln, too—will be ready to cool their cars the next time the pavements turn hot.

The gimmick in cooling a car is getting a refrigerating unit small enough to fit into a vehicle already pretty crowded with machinery. Chrysler now figures that it has this whipped. Its refrigerating unit is smaller than that in a home freezer.

But size is only part of the problem. A car is out in the open where the sun beats on it. Its windows admit the sun's infrared (heat) rays. The passengers themselves contribute heat and moisture. And engine heat drifts into the car.

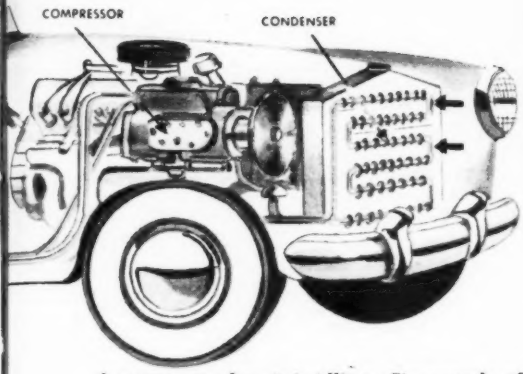
That's one of the reasons why air-conditioning units offered by Chrysler, Cadillac and Packard before World War II—yes, they were available more than a dozen years ago—never sold in large numbers. They just didn't have the capacity to handle all that heat. So Chrysler proceeded to beef up its system. It devised a unit with a capacity almost three times that offered before the war.

There was only one problem in getting the machinery into the car. The gas compressor, belt-driven off the engine crankshaft, fitted nicely on top of the block. An evaporator—where the liquid Freon becomes gas again and chills the supply of air to the passengers—and a blower to circulate the air were snugged onto the little shelf at the back of the luggage compartment.

Condenser a Problem

But the condenser was something else again. The condenser is the heart of the whole system. Here's why:

The gas must be compressed from a point where it won't condense to a point where it will—at available air temperatures. Freon 12 at the normal system pressure of 35 pounds per square inch will condense only when its temperature gets down to 38°.



horsepower when it is idling. Six pounds of Freon 12 will be used at a pressure of 180 lb.

Raising the pressure to 180 pounds, however, will make it condense at 130°.

Compressing the gas heats it up some 200°. And it's already pretty warm from the heat it has collected in the evaporator.

That's where the condenser comes in. It has to liquefy the Freon before the gas can start its job of cooling the car. But when the engineers put the condenser in front of the radiator to cool it, the coils blocked off so much air that the radiator soon overheated.

They finally solved that one, but just how is a secret.

A Detachable Unit?

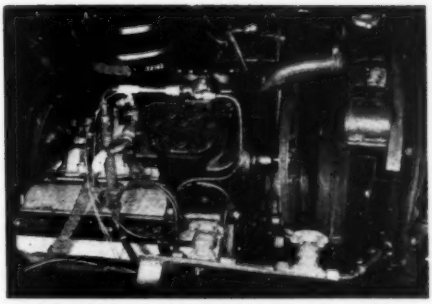
Getting rid of the excess moisture in the air ("It isn't the heat, it's the humidity") was a natural. The cold coils in the evaporator chill the air. Chilled air drops its moisture.

That leaves only one problem—the system requires extensive plumbing from the compressor and condenser to the evaporator, and that means a costly permanent installation.

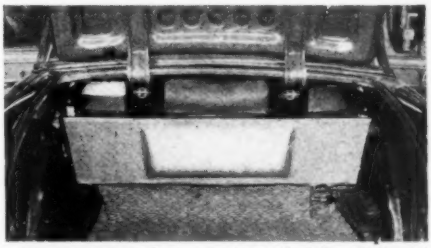
Now a Chrysler engineer thinks he has the answer to that one, too. He wants a package deal, a refrigerating unit that can be bolted into the trunk in 30 minutes and transferred to a new car when a man trades in his old jalopy.

That would mean supplying power to electric motors to turn the compressor and feed air to the condenser. It would require a better electric generating system.

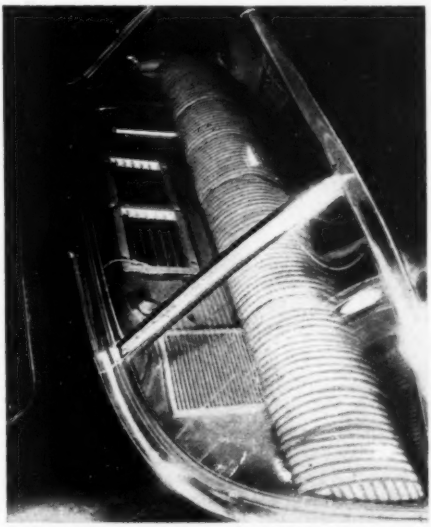
And that may also be in the works. END



COMPRESSOR on Chrysler experimental air conditioner is piston type mounted on engine block and turned by belt from crankshaft. GM will use a rotary type for Cadillac, Olds.



EVAPORATOR, where air is cooled for delivery to car interior, and blower occupy full width of trunk but only a few inches of its depth. No room normally devoted to luggage is used.



COOL AIR comes from vents behind rear seat. Air is one-fourth fresh, three-fourths recirculated to reduce load on cooling system. Control on dash regulates volume delivered.

NO AIR ESCAPES when a nail is driven into one of Firestone's new Champion tubeless tires. It leaks out slowly even when the nail is removed. Repair takes only a few seconds with the device at bottom, which forces an air-curing, self-sealing liquid rubber into hole.

1953 Cars

High-priced makes will lead the

By Wesley S. Griswold

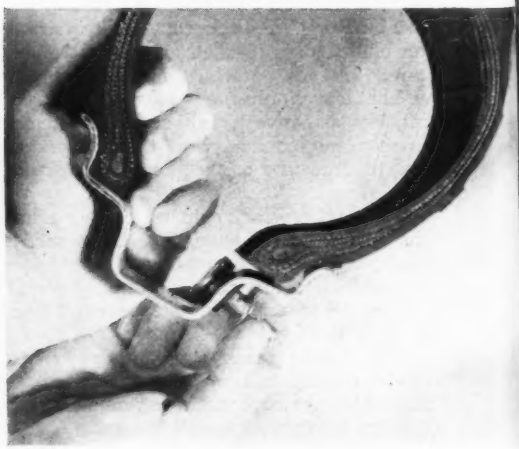
NEXT year's models of at least one well known, high-priced American car will come off the assembly lines with a full set of five tubeless tires. That, leading tire makers agree, will start a stampede. They predict that by 1954 you'll be able to get tubeless tires as original equipment on any new car you buy.

A tubeless tire is a casing with an air-tight lining. The rim necessarily becomes one wall of the tire. The valve is firmly seated in the rim, with rubber and metal washers holding it in place on both sides and providing the vital air seal.

Goodrich has been making tubeless tires since 1947, Firestone since early in 1951, but until this summer both companies' tubeless tires were premium-priced. In July, these two manufacturers simultaneously announced new models that will be closer to

Here's All

ONLY THE VALVE REMAINS, and for tubeless tires it is attached to the rim, as demonstrated below with a cross-section of tire and rim.



Will Have Tubeless Tires

way, setting off a rush to put them on everybody's car by 1954.

the cost of standard tires. U. S. Rubber says that if auto makers want to equip new cars with tubeless tires, U. S. Rubber will be ready. And Goodyear, fourth of the four big tire companies, admits that it, too, has made and tested a lot of tubeless tires.

One of the three major producers of popular-priced automobiles would like to put tubeless tires on his entire 1953 output. He likes the sample that one of his suppliers has offered, and wants to use it. All that is holding him back is this: Can the other suppliers produce a tire that will match it in quality and price, and soon enough?

Four Good Reasons

Why should anybody want to buy tubeless tires?

The men who design and build them say:

- They are safer than conventional tires.
- They provide a softer ride.
- They keep cooler at high speeds.
- They give up to 10 percent more mileage.

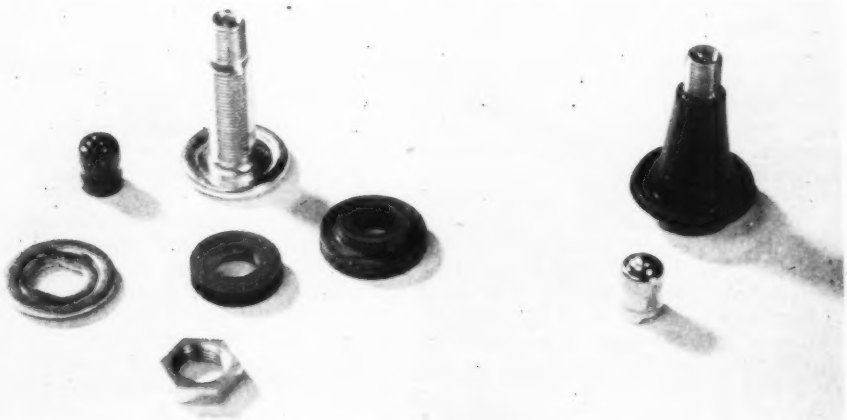
The tires that they are talking about are their latest, lowest priced models—the ones most likely to become original equipment on 1953 cars. They are practically immune to punctures and they're unusually hard to blow out. The reason is their lining, a butyl composition.

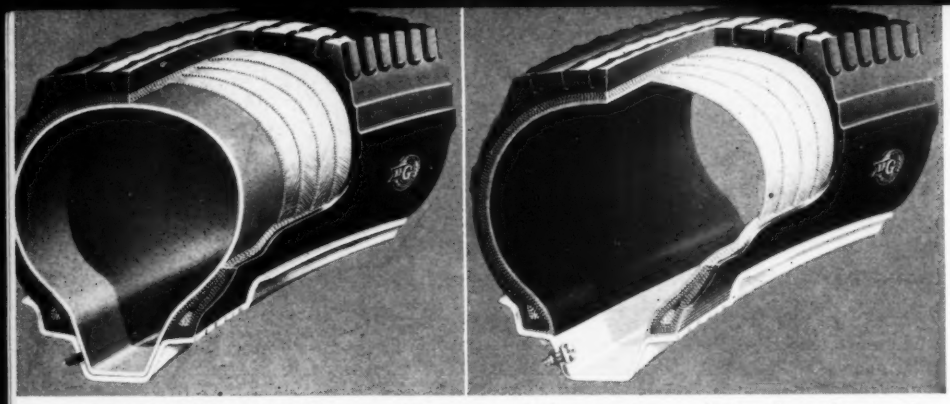
Tough, tightly knit, man-made butyl is 10 times as resistant to air seepage as natural rubber. Moreover, in tubeless tires it is vulcanized to the inside of the cord body, where there is no tension on it. When a nail pierces this lining, the butyl does not pull away from the puncture, the way the stretched skin of an inflated inner tube does. Instead, the butyl grasps the nail tightly. Air does not escape unless the nail is pulled out. Even then it takes its time. You could drive for miles with a nail in one of your tubeless tires and never know the difference.

You *can* blow out a tubeless tire, but

That Is Left of the "Old-Fashioned" Inner Tube

SIX PARTS make the assembly of the conventional valve for tubeless tires (left below) a time-consuming job. One solution offered is the experimental hard-rubber valve (right below). It has but two parts and is snapped into place mechanically from inside rim.





THE INSIDE STORY of the difference between a conventional tire and tube (left above) and a tubeless tire is told in these drawings of two Goodrich products. They illustrate clearly how an inner tube insulates the rim, bottling up heat that in a tubeless tire (right above) can escape through the metal. The latter fact is why tubeless tires run cooler.

not easily. Blowouts usually are caused by a violent pinching of the inner tube when the cord body of the tire is ruptured. This is most often the result of hitting a rock or a pothole at high speed. When such a rupture occurs in the body of a tubeless tire, the butyl lining, being vulcanized to the casing, can't be pinched. At worst, it will crack, thus letting the air out slowly rather than explosively.

The surest way to blow out a tubeless tire is to run it over a section of angle iron, or any other object guaranteed to cut a long, deep gash in it. A badly damaged rim will let the air out of a tubeless tire, but Firestone's testers have repeatedly driven tubeless tires against curbs and similar objects that an average driver might hit without ever knocking the air out of anything but themselves.

Reduced Friction Improves Ride

Almost everyone who has driven on tubeless tires reports that they ride easier. This is despite the fact that they are inflated to the same pressure—28 pounds—recommended for conventional super-balloons. Engineers say it is because inner friction disappeared with the inner tube.

The new tires run cooler at high speeds partly for this reason, partly because they are lighter (by almost the full weight of the average inner tube). But the chief cause of their coolness is the rim, which conducts heat away from the inside of the tire faster than it can when it is smothered by the inner tube of a conventional tire.

Taking the heat out of tires makes them last longer. The increased mileage promised for tubeless tires also will come from the greater strength that improved carbon blacks, cold rubber and new chemical compounds have given them.

Car makers are going to have to make certain that the butt welds on their rims are smoother, so that air can't escape by that route. Rims may have to be machined to closer tolerances to provide a tighter seat for tire beads. Assembly-line workers and the staffs of more than 100,000 service stations will have to learn how to install the special valve that tubeless tires now use.

But the enthusiastic prophets who say that tubeless tires for everybody are coming fast brush aside these obstacles as unimportant. They already can see the day when inner tubes will be as obsolete as the solid-rubber tires they replaced. END

Do You Remember?

Many early gas buggies retained the horse whip. Came in mighty handy for chasing curious canines away.

In the front-wheel-drive "Electrobat" (circa 1895) the back wheels did the steering. In motion, the vehicle appeared to be advancing to the rear.

One early auto, the Carter "Twin-Engine," carried a spare power plant: if one failed, the other got you home.

By Ralph R. Watts
Automotive Writer, *The Detroit News*

1953 Forecast

DIRECT FROM DETROIT

Here is what's being talked of for the new-model automobiles.

BUICK Overdue for restyling, the Buick is going to look a lot different. The hood will be shorter, the visibility better. That new V-8 engine, which but for Korea would have been here a year ago, will replace the famous old valve-in-head straight eight in at least the Roadmasters. The car will have more snap at take-off.

CADILLAC Power brakes are talked of to supplement its power steering. There'll be a new look. And (see p. 105) summer air conditioning by an actual refrigeration unit like that used in offices.

CHEVROLET Perhaps the biggest news in automobiles—because people buy more Chevrolets than any other brand of car—will be a complete overhauling in style, transmission and engine. Chevvy will have a new six to replace the engine that hasn't been changed much in 20 years. The Powerglide automatic transmission will have more oomph when the light turns green. Rumors of a new V-8 refuse to die.

DODGE A new V-8 engine to supplement the sturdy six is an open secret in Detroit. And a new automatic transmission may replace the semiautomatic.

FORD To its overhead-valve six—described by some authorities as the best in its class—Ford is going to add an overhead-valve eight, replacing the L-head that hasn't been changed much since the early 1930s. The new eight just missed '52.

HUDSON A "little" Hudson, not so little as the little cars but littler than the standard Hudsons, will make its appearance in the showrooms. It will be nothing like the Nash Rambler or the Henry J—nor will it be much cheaper than the big-three small cars. It will be a "big-little" car.

LINCOLN Look for both power brakes and power steering. Lincoln, like Chrysler and Cadillac, has been fiddling with air conditioning, but whether it will be added in 1953 is undecided.

MERCURY Like Ford, its smaller brother, this car will have a spanking new V-8 overhead-valve engine.

NASH The Rambler is going to get the works in the styling department.

OLDSMOBILE Power brakes are talked of and may become available.

PACKARD A new, and perhaps simplified, power-steering unit will be added to supplement the power brakes that Packard introduced this year. It's designed to meet the criticisms of existing power-steering systems—a wheel that turns too "fast" and boosters that respond too slowly.

PLYMOUTH The third of the small cars, the Plymouth will be new from front bumper to exhaust pipe. Don't be surprised if it undergoes changes in engine and transmission.

PONTIAC A new V-8 is beginning to emerge. It may take some time before a full view is seen.

STUDEBAKER That snub-nose look to the current Studebaker was a stopgap when a shortage of materials forced postponement of complete restyling in 1952. Now, all the changes are planned for '53. An overhead-valve six is on test stands.

• • •

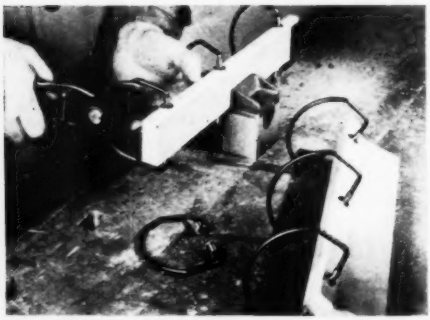
Modifications also due in Chrysler, De Soto, the Henry J, Kaiser, the Nash Statesman and Ambassador, and the Willys.

Jeep Scrubs Floors of 14-Acre Garage

ONE man riding this jeep scrubs more than 14 acres of floor in two days in a Los Angeles garage. A gas engine at the jeep's rear turns four brushes at the front while a tank feeds out scrub water. A squeegee behind the rear wheels gathers the dirtied water, which is then sucked up into a second tank. The Finnell System, Elkhart, Ind., makes the scrubber.

Power Jacks Raise Either End of Auto

FLIP a switch on the car at right and you can raise or lower either end of it on a built-in hydraulic jack. The car's two lifts, operated by a motor under the hood, draw up behind the bumpers when not in use. Turning the switch also sets the car's brakes. Vincent R. Paolucci, South Euclid, Ohio, invented the system.

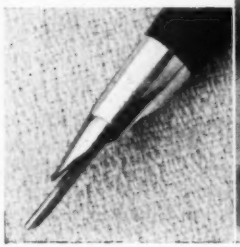


Spring Clamps Aid in Gluing

LIGHT gluing operations are made easier with these spring-steel clamps. They can be forced open and snapped onto the work with mounting pliers, leaving the craftsman one hand free to hold the glued part in position. Movable pressure plates on the jaws permit clamping beveled pieces. Georg Ott of Ulm an der Donau, South Germany, makes them in several sizes to take different thicknesses of wood.

Pen Takes Ink Through 'Straw'

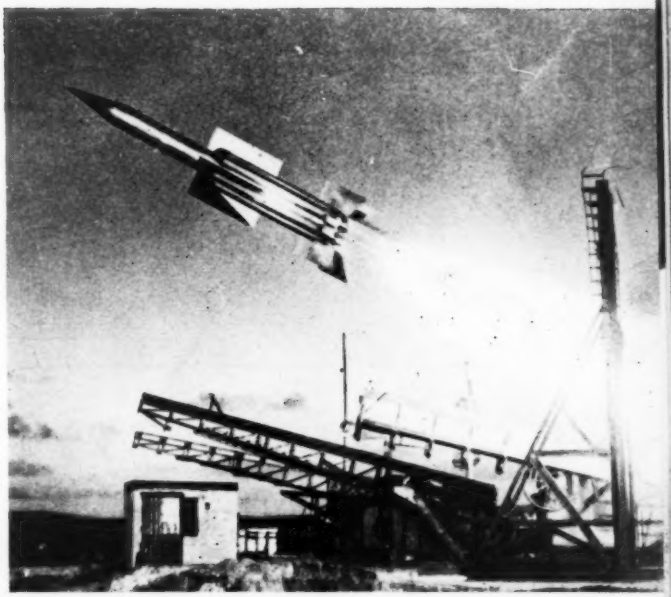
THIS pen carries a gold "drinking straw" to sip up ink when it needs refilling. The tube pops out from behind the nib when the cap on the top of the pen is unscrewed. Ink is drawn up as the lifted cap is pressed down, and screwing the cap back on retracts the tube. The nib is never touched by ink. Sheaffer calls the new fountain pen the Snorkel.



Two-Part Rocket to Outfight Fighters

THE British believe their newest guided missile is so good that it will make fighter pilots obsolete. Directed by radar beam, or steered by its electronic brain, it can outmaneuver and outfight the fastest fighter planes. It is said to be able to "hunt" a target at 2,000 m.p.h., chasing it as high as 10 miles and rapidly altering course to intercept it no matter how the quarry twists and turns.

Rocket motors on the outside, seen firing in the photo, give it an added boost at the take-off. They drop off seconds later and the missile continues on, powered by the main rocket motor, which is located inside.



Radar Backstops Watchman

IF THE gateman above takes his eyes off the road, an "electronic cop" watches for him. The reflector in the window aims a shortwave radio beam down the road. Any object moving in the beam will bounce the waves back to the transmitter and ring a bell. A car sounds the alarm hundreds of feet away; a pedestrian 100 feet away. The system guards the GE Research Laboratory.

75 years ago this month

Popular Science Monthly reported:

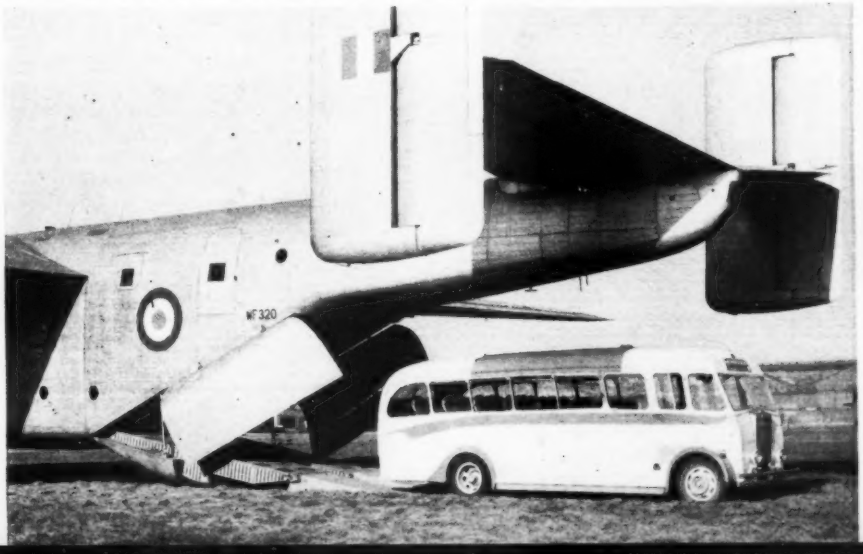
"IT IS only with the mouth open that snoring can be accomplished during sleep. It follows that any device which prevents the lower jaw from dropping down, during the relaxation of sleep, and opening the mouth, will prevent snoring. The apparatus represented, which consists of a simple cap, fitting the head snugly, and a piece of elastic webbing, can be made more or less tense as may be required to effect the closure of the mouth."

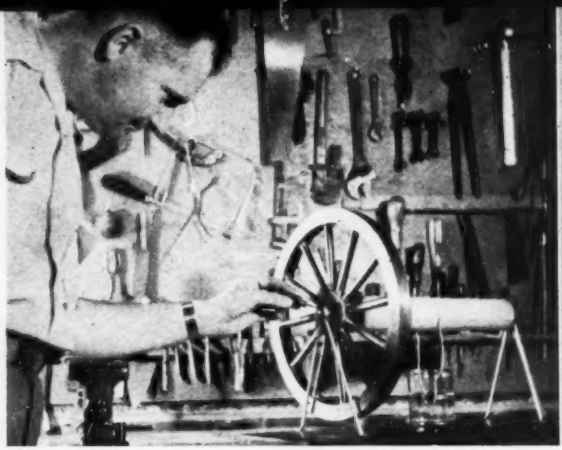
Triple-Decker to Ferry Cars and Passengers

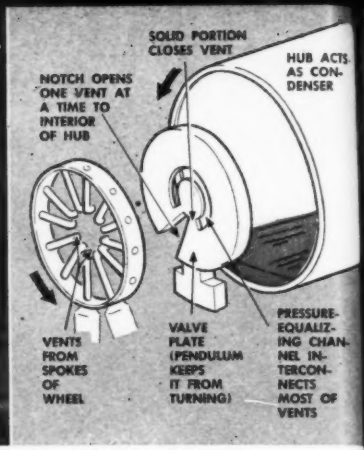
Redesigned model of Europe's largest air freighter will carry autos in aerial "hold" and passengers in a luxury tail cabin.

A BUILT-IN elevator will raise automobiles to the upper fuselage deck of a new version of the Blackburn Universal Freighter now being built in England. The two cargo decks will hold six to eight cars, depending on size. There also will be room for motorcycles and bicycles at one side of the lower deck. The upper deck in the tail, reached by a staircase, will accommodate 42 passengers. With this arrangement, it is claimed that the 55-ton plane can carry three times its present payload. The 180-mile-an-hour Freighter can land on and take off from grass fields.

Clamshell doors and loading ramp of the present version of the Freighter are shown below.







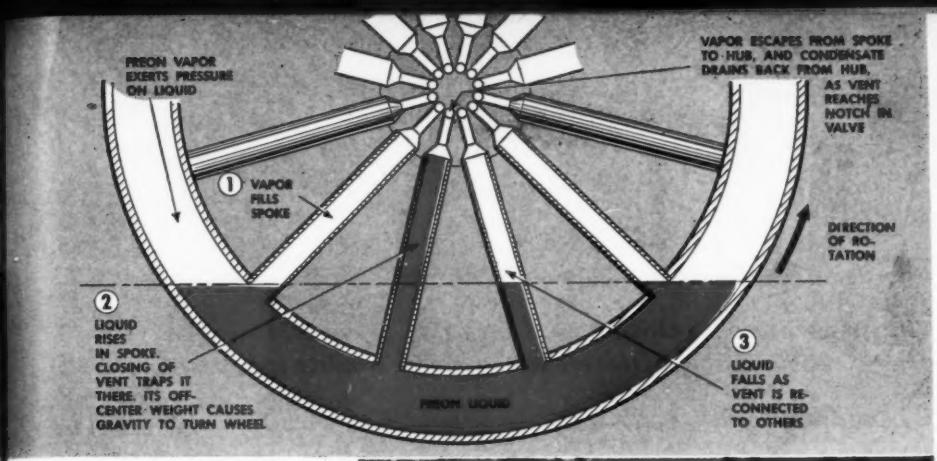
Inventor's Mysterious Motor Runs on Power Drawn from Atmosphere

WHEN Cmdr. Ivan Monk, who designs big turbines for the Navy, is pestered by inventors of perpetual-motion machines, he points to a device on his desk that goes them one better—for it works. It is a wheel that spins with no apparent source of power. Commander Monk built it in his spare time, and patented it, since it may find use in clocks, toys and advertising displays.

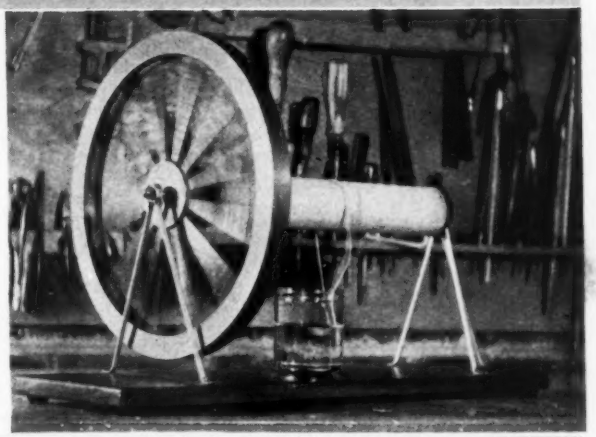
Actually it is a rotary heat engine, run by temperature difference between its parts. The wheel is at room heat; the long cloth-covered hub, kept dampened with water, is cooled by evaporation. A low-boiling-point liquid, Freon, circulates between wheel and hub, vaporizing in the wheel and condensing in the hub. Valves maintain an unequal weight of liquid on opposite sides of the wheel—and gravity does the rest, to turn it.

Prospecting Trucks Aid Hunt for Uranium Buried in the Earth

FOUR trucks like the one at left are speeding uranium prospecting in the western U. S. Backed up to a drill hole, a truck lowers down it a 2½-foot-long steel cylinder with winch, boom and cable. Wires connect a scintillation counter in the cylinder, which detects rays from uranium ores, to an automatic recorder that charts their levels. Built for the Atomic Energy Commission by Bogue Electric Mfg. Co., Paterson, N.J., the trucks save the time of taking and testing core samples.



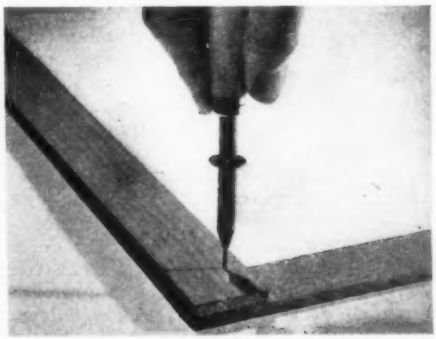
SECRET of mystery motor (at far left with inventor) is revealed above. Spoke nearing bottom fills with Freon liquid, which valve mechanism (left above) briefly traps in it. Resulting excess weight of this spoke turns the wheel.



MOTOR SPINS with no visible power source. Actual source, heat from atmosphere, evaporates water to cool elongated hub acting as condenser. Endless loop of string, dipping in beaker of water, keeps cloth-covered hub moistened.

Tool for Blind Drives Brads

INSERT a brad at the tip of this tool (below), and a magnetized plunger holds it. Pressing the handle drives it by extending the plunger against a spring. Wellman Products, Cleveland, makes the tool for the American Foundation for the Blind.



Tune Tells When Wash Is Dry

LAUNDRY automats now play a tune to announce that the wash is dry. Commissioned to fit an electric clothes drier with a music box, a Westinghouse engineer devised one whose five tone bars render the air of "How Dry I Am."

Will They Ever Climb

The man who came closest gets set to try again this month. Here's why even he doubts that he'll make it.

By Gardner Soule

IF, BY some miracle, you landed by parachute on the 29,002-foot summit of Mount Everest, you would remain conscious, without extra oxygen, about 1½ minutes. With oxygen, you might stay conscious for several hours. But the cold (as low as minus 65°), the winds (up to 150 m.p.h.) and the thin substratosphere would kill you before you could get down.

Yet only last May, Ramond Lambert, a Swiss mountaineer, and Sen Tensing, a native Sherpa porter, lived through a night 27,550 feet high up on Everest. They were in a tent but had no sleeping bags. They slapped each other all night long to maintain circulation. The next day they climbed up to 28,215 feet—the highest point on Everest man has reached, and lived.

Lambert could survive up there where you couldn't because his body and mind were acclimatized—that is, gradually adjusted to altitude by a long, slow climb from sea level. This trip is necessary if you want to live on Everest at all, and that is why you can't drop from a plane or helicopter.

EVEREST CLIMBER whiffs oxygen from tube in sketch of new lightweight equipment. For details, see page 121.

He'll Try the Impossible

Lambert is going to try for the summit again this month. He will try despite the conclusion of the expedition leader that 28,500 feet—502 feet from the top—is the place where body and mind can take no more, and the climber must turn back or die. This is the point, he thinks, of complete exhaustion, even after acclimatization and with oxygen.

His team doctor agrees.

In his determination to try again for the impossible, Lambert is following exactly the reasoning of all Everest climbers:

- It cannot be done.
- We'll try.

Other men besides Ramond Lambert are getting set. Now in the Everest area, making preparations for an attempt to lick the world's toughest peak in May, 1953, is Eric Earle Shipton, an Englishman, who has climbed in the Himalayas for 20 years.

Shipton, known for his reconnaissances, in October, 1951, discovered a new, southern route toward the summit. In the spirit of the Everest tradition, he turned over all his information to Lambert, who has a chance to beat him to the top before Shipton's next try in 1953.

They Know They May Fail

Shipton is as aware of the difficulties as Lambert. He knows that if Lambert fails he himself may be the one to make it. On the other hand, says Shipton, "there may be another 20 failures."

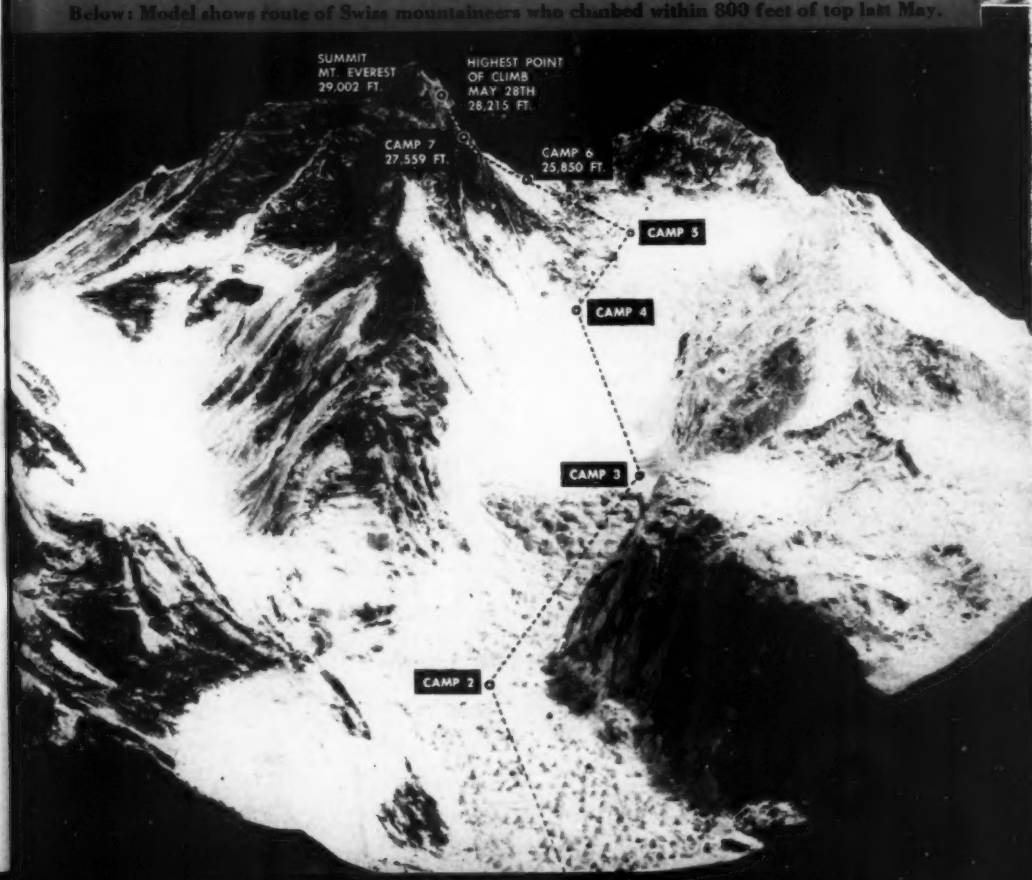
For even with the latest equipment, the odds still favor failure.

The hazards of climbing five miles up Mount Everest actually start near sea level in Nepal, an independent kingdom in northeast India, where Everest is located. Here you face jungle and disease and heat. And you have a 160-mile trek just to reach Everest, over mountain ranges, down through gorges, along unmarked and un-

Mt. Everest?

British Mosquito bomber skims past cloud-veiled Mt. Everest in this rare view of the peak.

Below: Model shows route of Swiss mountaineers who climbed within 800 feet of top last May.



mapped paths. You walk it all. Nepal is too rugged for horses.

The climate changes from tropic to arctic within 20 miles, as you climb 10,000 feet. At 10,000, at 17,000 and at 20,000 feet you may get mountain sickness (nausea). Each day more men of your party reach their limit and must turn back. After 20,000 feet only a few stay with you.

Himalaya—Abode of the Snow

Around 16,000 feet, higher than the highest peak in the Rockies, you enter the perpetual Abode of the Snow, a translation of the native word Himalaya. As your men fall back, so too do other forms of life. You are getting up where nothing lives.

At about 20,000 feet you are likely to see in the snow the tracks of the last land animal. These are the 12-inch footprints, each with two broad toes and a thumb, of the creature the natives call the Yeti. Almost every Everest climber—there have been about 40, in nine expeditions since 1921—has seen the tracks. Both Lambert and Shipton have. But no man has seen the Yeti.

The Yetis are, some natives say, a race of wild, hairy men, about five feet six inches tall, who live in the snow fields. That the Yetis have not been seen other natives easily explain: you cannot look upon a Yeti and live. Some day an Everest mountaineer may see and identify the Yeti. Meantime, he has been named, by the white man, the Abominable Snowman.

Up Where the Lammergeier Lives

Beyond the dwelling place of the Abominable Snowman, your camps will be visited by a few ravens and crows. Then they too fall back. One living thing still is with you: the lammergeier, the bearded vulture of the Himalayas with his seven- to 10-foot wingspread. He sticks around hopefully till beyond 23,000 feet. Then he too falls behind. Still you must climb, above the lammergeier, that last lifeless mile.

You try the last mile, the longest on earth because no one has reached the end of it and lived, with only the few members of your party who are left. Porters now carry only 10 pounds each. That is one reason why Everest is not likely to be conquered by heavy equipment; men cannot carry it up here, and a primus stove and oxygen are about all a climber can manage.

Your problems now become the greatest of the journey—so great that they have killed

BRITISH EXPLORER Eric Shipton (left) looks over model of Mt. Everest, 10 inches to the mile, based on his discovery of new approach he'll try next spring if Swiss fail this fall.

white and brown men and have forced back everyone they didn't kill. The big, final problems are:

- The mountain itself.
- The weather.
- Your body.
- Your mind.

Above 24,000 feet Everest presents her own greatest defenses: Ice cliffs as straight up as a battleship's bow. Crevasses that open to show blue-black space for thousands of feet. Loose snow that can trap a man to his armpits. Glaciers, always moving, that carry 70-foot icebergs on their surfaces. Icefalls—avalanches of ice. And ridges, narrow as a knife-edge, along which you must walk.

The very summit, the last 1,000 feet, appears to be simply reddish yellow rock with snow and ice on part of it and the rest kept bare by the constant wind. It looks fairly simple to climb—if you have strength enough left after the ramparts below. But here there is in the air only one-third of the oxygen you get at sea level. Even carrying cylinders of oxygen, your body still almost starves for more.

NEW OXYGEN SUPPLY for Everest mountaineers, sketched by G. H. Davis of *Illustrated London News*, weighs five pounds, compared to 40 pounds for old apparatus. Climber regulates intake by clenching and relaxing his bite on tube. Struggling up a steep slope at 28,000 feet, he uses four times the volume of air required during violent exertion at sea level. On Everest, just existing is violent exertion, and heavy mechanical equipment cannot be brought along. Thus lighter oxygen supply may be deciding factor in attaining peak.

Atop Everest there is no good weather, only bad and worse. The arctic and tropic climates of the area clash continually to produce conflicting winds, storms, monsoons, blizzards. The temperature changes instantaneously. This changes snow conditions. In an instant an avalanche can bury you. In the wind, at night, you and your companions must fight to hold down the tent floor. If it gets under the floor, the wind can hurl tent and contents into a glacier thousands of feet below.

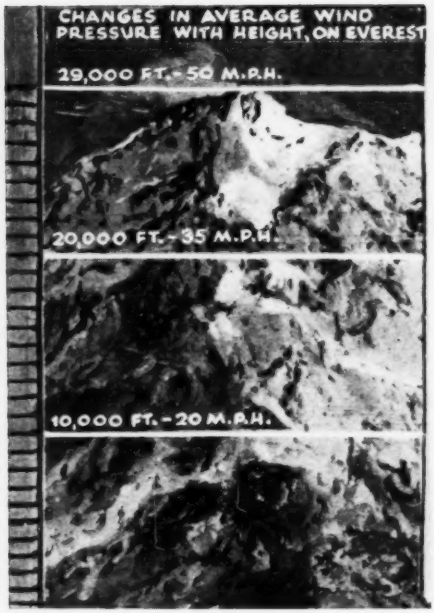
Deterioration Is Rapid

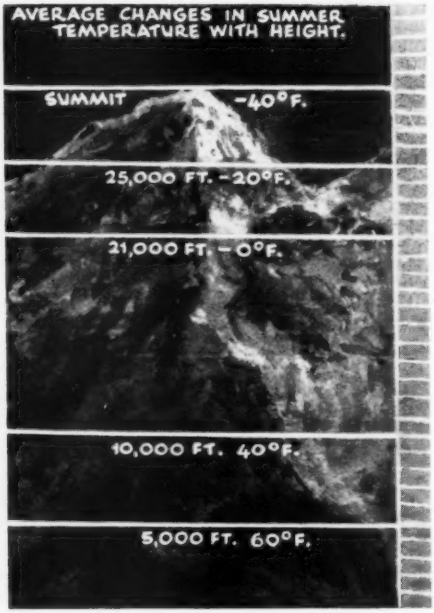
Despite acclimatization, your body deteriorates on Everest's last mile, and the painfully slow race toward the summit is a race between you and deterioration. Deterioration has, so far, always won, as Lambert thinks it will again.

Your arms and legs may become paralyzed. A headache can seem to split your brain in two. The slightest exertion, like tying a shoe lace, leaves you breathless. Fatigue glues muscles—in a place where to stand still is to freeze to death. Your legs may collapse under you—in an area where once you start sliding you can go down for miles.

Few men can sleep up here. If you can sleep, without rolling off the slanting rock ledges to drop a mile or two, you wake up feeling suffocated. You lose weight fast. You first cannot eat meat, then you cannot eat anything solid. You are thirstier than anywhere else on earth. An Everest mountaineer once drank 17 cups of tea without moving. You may have diarrhea while your kidneys function once in 24 hours. Dry air is the reason you stop discharging liquid.

Your face and lips turn blue. Your frost-bitten fingers stiffen around the handle of your ice axe and must be pried open. Your eyes sink in their sockets. You see double where you must watch every step. You are likely to be blinded by the glare from snow or the rocks if you have to remove your goggles, which you must if they freeze over. One snow-blinded mountaineer had to be led off the mountain before he recovered sight. Getting him down was an incredible feat both for him and his companions. But





on Everest acts of heroism are routine.

Your teeth turn brittle. Your heart enlarges and pounds. You get altitude sore throat, an extremely painful experience caused, like your failure to urinate, by the dry air.

Like your body, your mind becomes another great problem. Despite rapid deterioration of the body, some think the mind goes out first.

You Want to Die

You may get irritable. You can force yourself to be cheerful, but you may have to get a few steps away by yourself and bawl like a baby. You want to die. You may think you are dead. A porter became so convinced he was dead that he refused to move and actually had to be forced down the mountain by his teammates. He argued volubly that he was dead till he had descended a couple of miles.

Your judgment becomes shaky. Your memory fades. Your will power evaporates. Without taking a drink, you get drunk. Shipton says the mountaineer on the upper slopes of Everest is "like a sick man climbing in a dream."

Then all at once you may suddenly have a great surge of pleasant feeling, a belief that everything is going well. At that dangerous moment you are most likely to fail.

"A man who knows how to get to the top may be an expert climber," the mountain men say, "but a man who knows when to turn back is a mountaineer."

When he was 792 feet from the summit last May, going upward at the rate of three steps before each pause for rest, Lambert got this feeling. "I felt magnificent," he said. It was then he knew he had to turn back. He did.

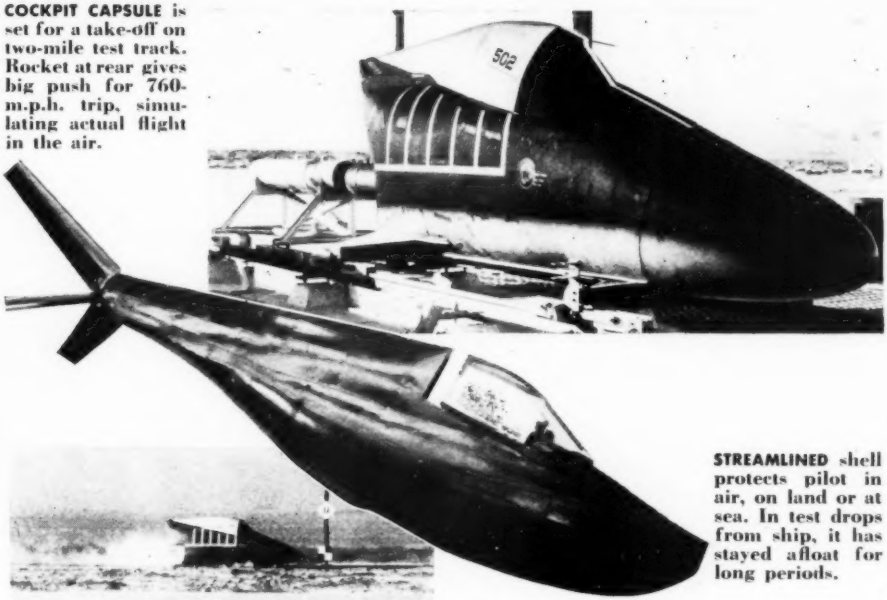
You turn down. There is no relief. In the Alps and on most other mountains one immediately regains strength and sanity after a short descent. You do not on Everest. This is one reason it may be impossible to reach the summit and live: the descent is as fatiguing as the ascent, and the descent may drain away the life that remains in you. Everest takes every dreg of your strength. Only over months can you get it back.

Who climbs Everest? Athletes? No. Truck drivers? No. Stevedores? No. Schoolteachers do. College professors. Army officers. Photographers. Writers. Doctors. Civil servants. Shipton was a British consul. Artists. On the record, it is the poets, the philosophers, the thinkers and the dreamers. Most have been not men of brawn or muscle, but slightly

[*Continued on page 262*]

Cockpit Takes Off at 760 M. P. H., Parachutes Safely to Earth

COCKPIT CAPSULE is set for a take-off on two-mile test track. Rocket at rear gives big push for 760-m.p.h. trip, simulating actual flight in the air.



STREAMLINED shell protects pilot in air, on land or at sea. In test drops from ship, it has stayed afloat for long periods.

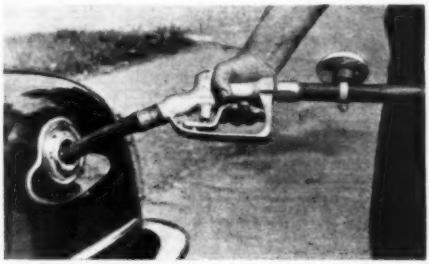
"FLYING" on test track, capsule is ejected by rocket, then unfolds stabilizing fins. Bottom frame of movie strip shows first 'chute blossoming out to slow capsule's fall.

PILOTS of supersonic fighter planes will fly without parachutes. If one has to bail out, he will touch off a cartridge to make the whole cockpit take off on its own. In an unmanned model that the Navy is now testing at Inyokern, Calif., as shown in the pictures at left, three fins unfold to stabilize the cockpit capsule in the air. Parachutes, first a small one, then a larger one, open out to slow its fall, and the sealed and pressurized compartment rides safely down. If it comes down on water, the parachutes are quickly unhooked and a boom holding the plane's storage battery is lowered to keep it upright.

Douglas engineers at El Segundo, Calif., developed the capsule.

Gas Cap Sticks to Hose

WHEN Ellis Sharp, a gas-station operator of Kansas City, Mo., gets a call to fill 'er up, he puts the car's gas cap on a magnetic holder fixed to the hose. Since it is right under his eye, he can't forget where he laid it or fail to put it back on the car.



'Space Men' Make College Men Think

MIT students design home gadgets for imaginary creatures living on a distant planet.

By Hartley E. Howe

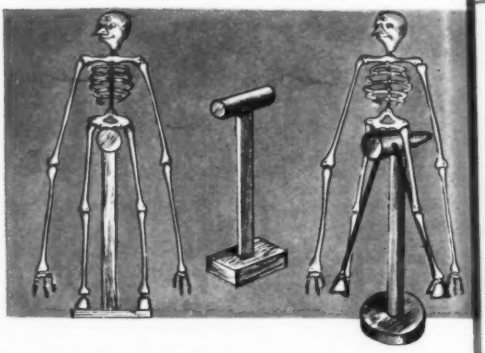
THIS fall some 20 of the brightest students at famed Massachusetts Institute of Technology are designing products for export to the Methanians. This birdlike but intelligent race, as you may not remember, lives on the fourth planet of the star Arcturus, 33 light-years away. As a result, the problems faced by the MIT designers are a little out of the ordinary. For example:

- Everything on Arcturus IV weighs 11 times as much as on earth, because of the great mass of that planet.
- The atmosphere is methane, and the inhabitants use ammonia instead of water.
- The Methanians themselves, having evolved from birds instead of mammals, are built rather like gigantic King penguins.

Imaginary People Offer Real Problems

Pretty fantastic? Right out of H. G. Wells or the latest issue of *Utterly Unbelievable Stories?* Don't worry, the learned professors at MIT haven't gone off their rockers from reading too much science fiction. The existence of the Methanians and their planet may be hypothetical, but their part in training a new breed of scientist is very real.

For John E. Arnold, who dreamed up the Methanians, believes that colleges should teach more than the technical skills and analytical ability of a good scientist or engineer. An associate professor of mechanical engineering at MIT, he believes it important to develop the students' ability to think creatively, to see beyond the limits of our present achievements. Professor Arnold wants to develop men who can find drastic new solutions to old problems—and discover and solve new problems not yet recognized.



NATIVE METHANIAN CHAIRS are straddled because of awkward length of imaginary Methanian's arms and legs. Type at right above has stirrups, is perhaps used as bar stool.

So Arcturus IV and its inhabitants appear in Professor Arnold's course in Product Design for very definite reasons. When a student starts the Arcturus project, he enters a whole new world where it is useless to try to copy the conventional and accepted. He must use his imagination and think creatively whether he wants to or not—or he won't solve his problems.

Equally important, designing for the Methanians forces the student to think about a host of physical factors that we all take for granted when we think about the human race and our familiar earth. Climate, gravity, physical structure, cultural habits—all that must be taken into account.

He quickly learns, for example, to think of weight as an important factor in any tool or appliance. A 10-pound object on earth

MIT LOUNGE CHAIR was designed using theoretical dimensions of average Methanian. It would be made of plastic and magnesium alloy. All figures are skeletonized to show how design matches body structure. Note hooves.

weighs 110 pounds on Arcturus IV. Like human beings, the Methanians can lift only about twice their own weight. Since the heaviest Methanians would weigh only about 17 pounds here on earth (187 pounds on Arcturus IV), this limits their tools and utensils to 35 earth pounds.

Life in the 30th Century

The student gathers this information from an impressive collection of photostated letters and memoranda dated 2951, an era when the exploration of outer space has become commonplace. These facts are gathered into a workbook, which opens with a solemn warning from the general manager of Massachusetts Intergalactic Traders, Inc., typed on his own letterhead, that "any person not cleared who reads further in this file does so at their own risk and is subject to the extreme penalty of the law."

From there on, the student finds himself in the world of 2951 A.D. A confidential memo from Massachusetts Intergalactic Traders to Terran Exporting Counsel Headquarters asks for further information about the newly discovered Arcturus IV for use in designing articles to export to that new market. Letters, memoranda and research reports, all on 2951 letterheads, tell how exploring parties visit the Methanians at their great city, Snafu, (pop. 15,500,000), learn their language, study their life and do market research on their needs.

With this to guide him, the student quickly becomes an expert on Arcturus IV. The

BABY STROLLER for Methanians is designed for use as portable incubator before youngster is hatched from the egg. Unfortunately Methanian social scientists vetoed it as too radical a change from normal method: carrying eggs in pouches.

Methanians are so light, for example, apparently because their bones are hollow and are filled with hydrogen or helium. The females are about four feet tall, the males a foot taller.

Bird People Have X-Ray Eye

Their bird ancestry is shown by their long arms, once wings, tipped with two clawlike fingers. Their faces are somewhat like birds, with a nose like a beak. Besides two highly sensitive eyes that can see infrared and ultraviolet as well as ordinary light, a Methanian has a third eye in the middle of his forehead that gives him X-ray vision.

The "reports" reveal that the average winter temperature on Arcturus IV is about 166° F. below zero. Although in summer the mercury climbs to a torrid 58° below, it is not surprising that Methanians have a warm coat of feather-like fur. They wear clothing besides, but their normal body temperature is still about 40° below.

The Methanians have an alphabet, and a number system based on six. They are reported to be patient, intelligent, monogamous and interested in the arts. By our standards, however, they move slowly, think slowly and react slowly. Their normal walking pace is about a quarter of a mile an hour, although they can sprint two miles an hour in short bursts. Their reaction time is two seconds—a major problem is designing machine controls.

The Methanians use atomic power to generate electricity, but know nothing of electronics. Steel and iron are too heavy for wide use in building and manufacturing, which depend on aluminum, magnesium, titanium and the plastics. Lithium is scarce but greatly valued because it is so light.

The "day"—the time in which Arcturus IV revolves once around its own axis—is 159 earth hours long. It takes 2,720 of these days for the planet to complete one trip around its sun, so that one Methanian year equals about 49 of ours. Methanian babies are born in eggs, mature in an Arcturan year and are very old after 10 years. Because of the bleak environment, few reach extreme old age. (Though 490 earth years are not to be sneezed at.)

In general, the Methanian civilization is described as of a "somewhat backward culture—early 20th century." Which in 2951 is going to look pretty backward indeed.

Designs Must Really Work

Fortified with this basic information, the student is commissioned by MIT—Massachusetts Intergalactic Traders, of course—to design some machine or household equipment for the Methanian market. Right here, rigid engineering standards take over. The product must be designed to be made with accepted materials and methods, and to work.

So far—the course has only been given one year—the students have confined their projects to equipment for the Methanian household. An MIT chair provides arm sup-

ports and a contour shape that lets the Methanians sprawl at ease. Methanians have never had clocks, depending on a system of sound signals to give them an approximate idea of the time. Now a Tech clock has been designed with three dials numbered with the complicated Methanian units.

Machine "Mows" Upside-Down Plants

An MIT kitchen mixer is made with the motor in the base—the average Methanian housewife isn't strong enough to lift a motor arm. A cigarette lighter has a throw-away cartridge of oxygen for use in the methane atmosphere of Arcturus IV.

One of the most complicated of the MIT appliances is a machine that does the work of a lawn mower. In Arcturus IV, vegetation grows downward, taking carbon, silicon and some oxygen from the soil. The roots are in the air, taking oxygen from CO_2, extracting nitrogen and hydrogen, and giving off methane. For their lawns, the Methanians have developed a plant called "Herbivorous carnivorous arnoldious."

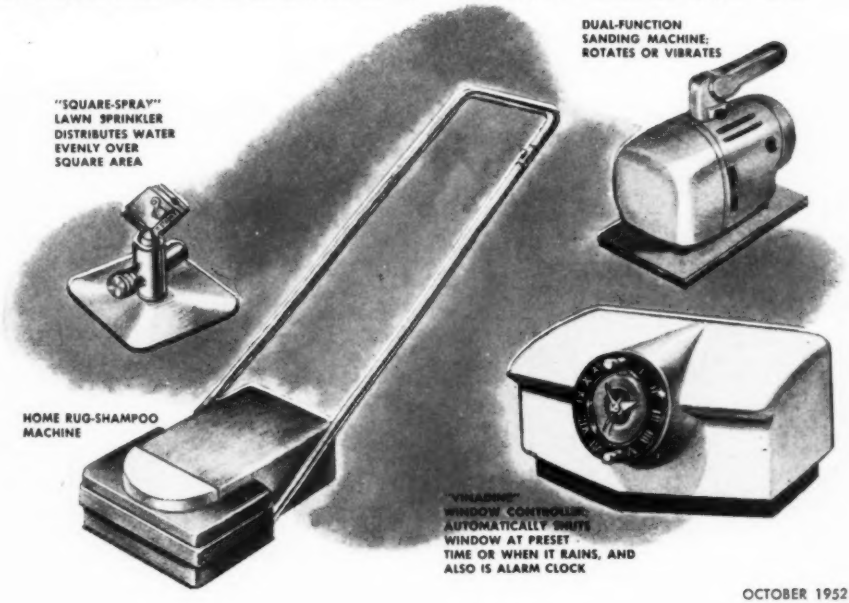
To quote a report to the Massachusetts Intergalactic Traders: "There is one serious drawback to the use of this species of lawn

[*Continued on page 266*]

Professor Fathered Methanians

Associate Professor John E. Arnold, above with Methanian mixer design, is the Father of Methania. Trained in English and psychology, he worked in a factory during the depression, became a draftsman by buying a set of tools and sitting up all night with a textbook. Later he did five years' work at MIT in three, became a mechanical engineer.

U.S. MARKET is also considered by MIT students of product designing. Here are some of the new tools and appliances they have come up with—some of which may eventually be produced. Courses emphasize creativity, but designs must be technically practical. Some products are developed by individual students; others are group problems.



Wingtip Shotguns
Fire Rocket Salvo

IF A hunter were a superhuman marksman he could use a rifle to down flying ducks. But being human, his aim at a moving target is not accurate enough. So he uses the blanketing effect of a shotgun shell to increase his probabilities of a kill.

For the same reason—that even our latest electronic aiming and firing devices are not accurate enough—the Air Force's newest jet interceptor, the Northrop F-89D Scorpion, fires a salvo of deadly Mighty Mouse rockets from each wingtip with the spreading blast effect of a double-barreled shotgun.

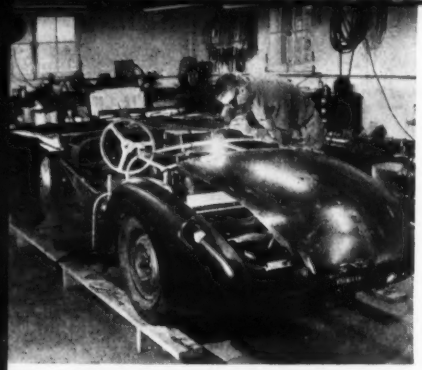
The Air Force will not reveal the effective range of its new rocket weapon, the method of approach and attack, details of the launching mechanism, or the number of rockets.

But in those twin pods are destructive, folding-fin 2.75-inch Mighty Mouse missiles. One hit by one rocket is all that is needed to send an enemy bomber hurtling earthward in flames, disintegrated by its own bomb load. And kill probabilities are high "since the target area blanketed when all rockets are fired is extensive." The F-89D, designed for all-weather, day-and-night operations, has a speed in excess of 600 miles an hour and can fly above 40,000 feet.

The Scorpion, weighing more than 40,000 pounds, carries a crew of two: pilot and radarman. But when it comes to the actual shooting, they are along for the ride. They just watch the radar and electronic equipment that picks up the enemy while it is still out of sight, locks onto it, tracks it and adjusts speed and course. Aiming is automatic and an electronic device triggers the rocket-firing mechanism.—*Herbert O. Johansen.*

America's Latest Answer to the Threat of Enemy A-Bombers

The sting of this Scorpion means death to the largest bomber. Shown below salvoing its arsenal of rockets from wingtip pods, the Northrop F-89D is our most potent aerial weapon against any enemy who might try to penetrate our shores or borders. The new Air Force interceptor has a speed in excess of 600 miles an hour. Inset (lower right) shows rocket pods more clearly.



BODY BUILDING IN PROGRESS. Broadwell is shown welding a tubular frame that will connect the unmated fenders and trunk lid to the chassis.

WIRING, of which there was 250 feet altogether, was completed outdoors. Steering wheel, cut from one piece of aluminum, has a walnut rim.

Hand-Tooled Sportster Built in Basement

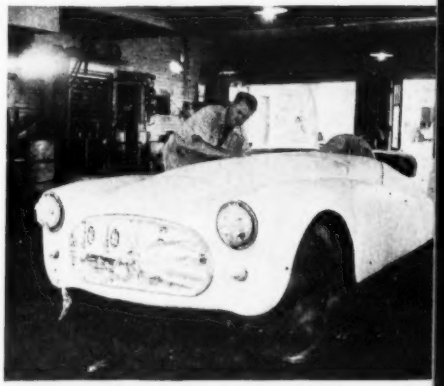
ONE of the smartest-looking new cars on the road this fall is a crazy quilt of parts from six other automobiles, ranging in date from 1940 to 1951. Its owner and builder, St. Louis sports-car fan James P. Broadwell (shown above leaning over his handsome creation) put it together without help, model or drawings in his basement workshop. The fact that his shop is stocked with $10,000 worth of tools came in very handy. Fortunately, also, he had had the forethought to provide the basement with a door wide enough to move the car through when it was finished. Building the car took most of his spare time for three and a half years and used up about $3,000 worth of materials.

Starting out with the wreck of a 1942 Studebaker Champion, Broadwell saved only the chassis. This he lowered, shortened and rewelded before clamping to it the front fenders of a 1946 Chevrolet, the rear fenders of a 1940 Buick and the trunk lid of a 1941 Buick. He then built a frame to support the fenders and lid in their proper positions. "The rest of the lines," he says, "just fell in." Broadwell hand-shaped most of the body contours from cold-rolled sheet steel on a homemade metal-curving machine. He shaped the hood from aluminum.

The engine, which develops around 125 horsepower and can drive the car to 115 miles an hour, is a Broadwell product, too, from the bottom—the original Studebaker block—up. He rebored the cylinders, changed the angle of the intake valves, installed a special camshaft, aluminum cylinder head and two synchronized carburetors.

Broadwell gave his low-slung hybrid a name, too, made up of parts of others. He calls it the Jabro, a combination of letters from his own first and last names. END

THE JABRO'S BODY, with its priming coats on here, was continuous-seam welded into a single piece, which was then welded to the frame.



MINUS WINDSHIELD, which Broadwell designed and built from scratch, the Jabro is rubbed down after six coats of lacquer had been applied.

Italian Inventor's Midget Flying Saucer Hits 87 M.P.H.

To PROVE that a perfectly round plane can fly, Piero Gnesi, an aeronautical engineer of Pisa, Italy, built the model above. He says the 30-inch disk of paper-covered balsa wood flies fine, whizzing along at 87 miles an hour. A special gasoline mixture fuels the tiny motor, and the craft is controlled from the ground with wires. Gnesi, a European model-plane champ, has kept it aloft for nearly three minutes.

Snap-On Clips Replace Tire Chains

THESE cradle-like clips clamp to a tire to give a car traction on snow, ice or mud. Joseph LaRocca of Cleveland tried for eight years to interest manufacturers in his invention. This year it will be marketed by a company formed by James H. Rand III, inventor and research consultant of Bratenahl, Ohio.

TIRE CLIP snaps into place when the car is backed over it. Three of the spring-steel clips are fitted to each rear wheel. Pulling on the sides of the clips easily springs them back open for quick removal. Planned for production this fall, they are expected to cost less than tire chains.

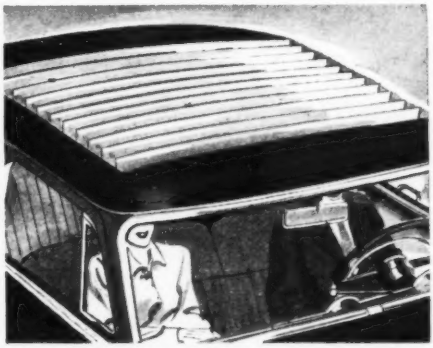
I'd like to see them make . . .

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.

A FIRE EXTINGUISHER, mounted on the inside of the hood of a car, that would go into operation automatically in case the engine caught fire.—*Robert P. Hoffman, San Francisco.*

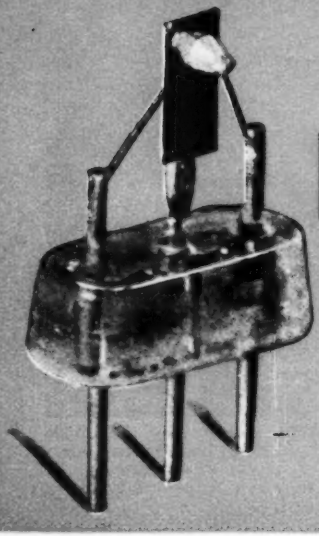
A BATHROOM SCALE that would *not* return to zero when you stepped off—so you could check your weight more closely. A push button would put scale back to zero.—*Myron Steir, NYC.*

THEATER SEATS WITH HEADRESTS similar to those on a barber's or dentist's chair. You could pull up the headrest, lean back and enjoy the movie.—*John Shork, Jewett City, Conn.*



A VENETIAN-BLIND AUTO TOP for controlling sunshine, air and visibility. Waterproof when shut, it would be operated by a crank on the dashboard.—*Irving Surdam, Winsted, Conn.*

A STOVE with heating units that would turn on when a pot was placed on top of the burner—shut off when the pot was removed.—*Mrs. Ann Dickinson, Buena Vista, Ga.*



Industry Speeds Production of

Midget Brains for Mechanical Men

Uncle Sam has first call on transistors now, but look for them soon in pocket radios and TVs almost that small.

By George H. Waltz Jr.

A ROBOT chess player that took on all challengers, and generally beat them, had the Nineteenth Century world in a tizzy. All went well until the "machine's" human operator, a midget chess wizard named William Schlumberger, forgot one day and raised the lid of the box in which he hid.

MICROSCOPIC WELDING JOB. Cat's-whiskers, no larger than human hairs, are bonded to germanium pellets on GE's transistor assembly line, then embedded in plastic.

When the lids are lifted on tomorrow's mechanical men—super-electronic calculating machines, remote-controlled locomotives and automatic factories, you will find no Schlumberger at the controls. In his place will be tiny electronic operators, each the size of a kernel of corn.

They will be transistors. Four years ago these Tom Thumb power amplifiers were laboratory curiosities (PSM, Sept. '48, p. 117). Now, although it is still too soon to make full use of their possibilities, the transistors have taken out their working papers and passed a rigid armed services' physical. Uncle Sam wants nearly every transistor that can be made.

Practically Indestructible

Until now only two basic types have appeared. The older design, known as the "point-contact" type, consists of nothing more complicated than three wires attached to a sliver of germanium metal. One model of the second, or "junction," type sandwiches germanium between two thin layers of indium which serve as contacts. In each case the germanium, a unique metal that can be recovered from chimney gases, is used because it has natural rectifying properties, allowing electrons to be controlled much as they are by a vacuum tube.

What has the transistor got to account for the demand? These mighty midgets do

CONTRAST IN MINIATURES. Junction transistor takes only twentieth the space of smallest electronic tube (right), and scientists say that future germanium midgets may be smaller.

much of the work of electronic tubes but require no warm-up time, and because they don't heat up, they last much longer than tubes. There is no glass-enclosed vacuum; their elements are simply encased in a plastic jacket, making them practically indestructible.

Work on Flea Power

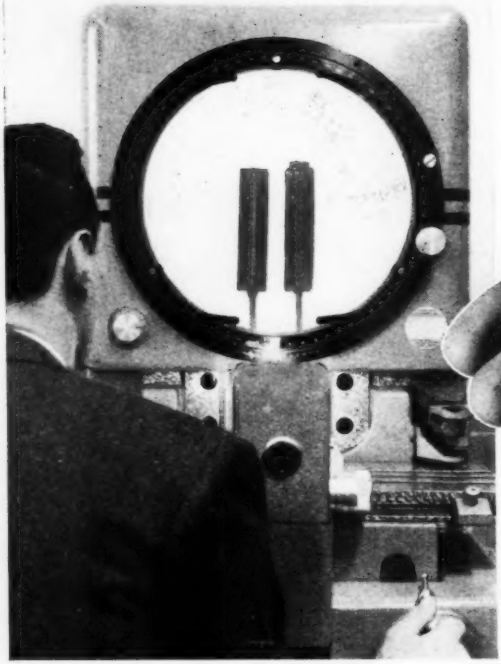
The energy expended by a flea jumping once each minute would be enough to keep a transistor perking. As a result, they are normally powered by lightweight, long-lasting batteries. Sometimes, even light striking a photocell, or the heat of the human body, provides power enough.

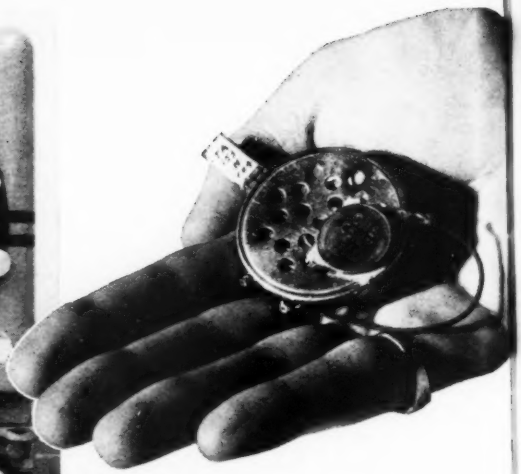
It is this, plus the Lilliputian size and weight—20 could fit inside one miniature vacuum tube—which excites the military designers. Imagine every GI carrying a two-way radio inside his helmet, receiving orders through bone-conduction phones, and switching off a throat-type microphone to express his personal reactions.

Better brains for guided missiles, really portable radar equipment, easily concealed beam generators to guide fast attack bombers to their objectives, and even lightweight electronic computers that would tell the brass their chances of victory long before a battle were fought—these are among the intriguing possibilities.

HEAVY BATTERIES ARE ELIMINATED with this transistor-equipped megaphone, which can throw a normal speaking voice a city block. One small dry cell supplies the current.

One of the most intricate electronic "brains" built to date—the IBM selective-sequence computer—occupies three sides of a huge and specially designed hall. In its maze of circuits and relays are 6,000 electron tubes. The heat which they generate calls for air conditioning, and the power demands are enormous. What's more, this super calculator is a temperamental machine, subject to nervous breakdowns every time a tube burns out. But by substituting husky little transistors for the vacuum tubes, the control area could be reduced to less than one-fifteenth of its present area. With space savings like that it is altogether likely





PENNY, separated from a speaker case by a wet blotter, makes a battery powerful enough to operate transistor audio oscillator (above).

FLEA'S-EYE VIEW of transistors is provided by contour projector (left). Technician is checking crystal structure of germanium.

that tomorrow's businessman may add an electronic computer to his desk-top equipment.

Almost completely automatic manufacturing plants with electronic brains making routine decisions and then carrying them out, are envisioned. In that event we can expect to see transistors controlling the machines which will turn out still more transistors.

Featherweight hearing aids even smaller than the postwar models are another possible application for transistors. And in the field of home radios and television sets, we are told to look for pocket-size models which will duplicate the performance of the most modern console chassis. (A transistor radio that you can make yourself is described on page 237.)

Higher Frequencies Sought

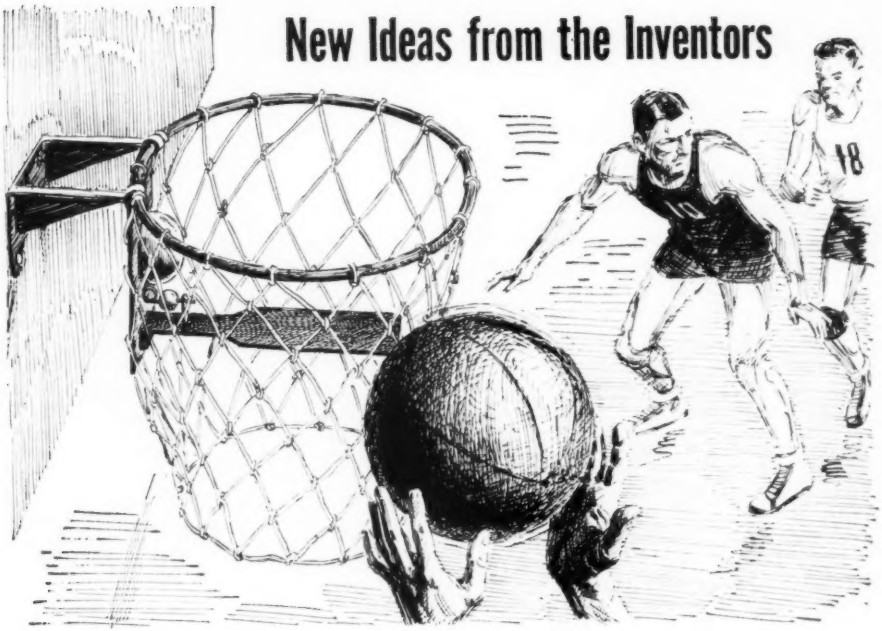
There are still problems to be solved, however, before transistors become as common as tubes. One is "noise" (the hissing heard when a radio is turned up loud). Another is frequency. Until a few months ago few experimental transistors could be made to work at frequencies above those involved in audio circuits. But RCA has just announced that it has boosted the frequency of several units high enough for use in FM radios and TV sets. It is even possible that some day the electronic picture tube might be replaced by a descendant of today's transistor—a simple, long-life unit which will produce the TV image by a flow of electrons in a rugged solid.

What about cost? You can't run down to the local radio shop and pick up a handful of transistors, but Western Electric does sell experimental models for about $6. Eventually, many technicians believe, the units may sell for as little as a dime. END

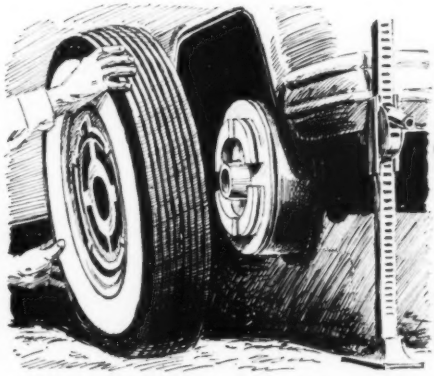
Quotes

- "We must sit down before facts like a little child, and follow wherever they may lead."—*Thomas Huxley.*
- "The future of our civilization depends upon the widening spread and the deepening hold of the scientific habit of mind."—*John Dewey.*
- "By research today we can insure prosperity tomorrow."—*Karl T. Compton.*

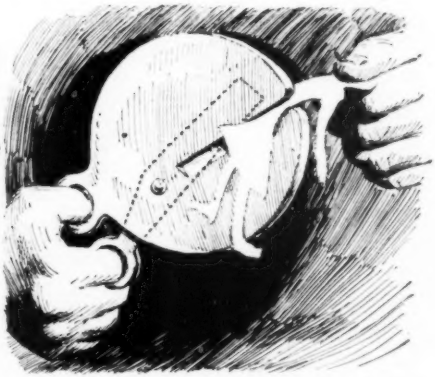
New Ideas from the Inventors



1 Basket to Signal Scores. Neither players nor spectators would be in doubt about close basketball shots if the basket rang a bell. A ball passing through this hoop would depress a paddle and release a spring-held clapper. Springs would automatically reset the clapper and paddle after each score, holding them poised for the next play. The bell ringer would not be affected by side swipes.



2 Quick-Change Wheel to Clip on Rim. You would only have to pull a lever to free this wheel from its drum. Curved slots in the wheel would slide over grooved projections on the drum. A tapered ring wedged into the grooves would lock the wheel on. The lever would pry the retaining ring out of the grooves to free the wheel.



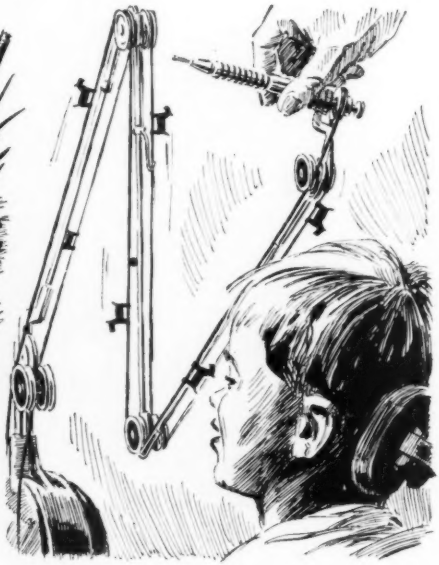
3 Child's Scissors to Guard Fingers. It would take a determined child to hurt himself on this paper cutter. The scissors would have one conventional blade and one formed as a slot in an oval plate. The narrow slot would admit paper and other thin material but keep out fingers, clothing and the like.

Please turn the page for more new ideas.

MORE New Ideas from the Inventors

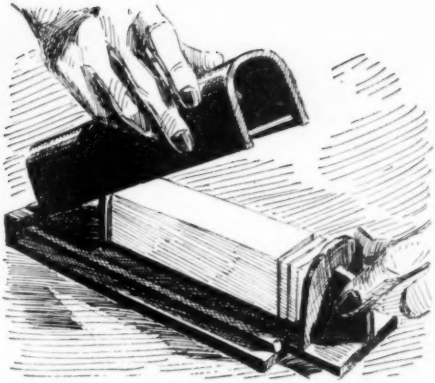
4 Mirror to Signal Turns. This rear-view mirror would serve as a turning signal, too. The surface of the mirror would be thinly silvered and a pointer outline would shine through when illuminated by a bulb within. A pair of the mirror signals, operated by a hand switch, could be attached to doors on each side of a car.

7 Drag to Retrieve Ducks. When game is shot down in the water, the aid sketched above would save wading or going after it in a boat. The folded wood frame would be thrown like a javelin. A tug on a line would release a spring to unfold the T-shaped float, which would rake the duck in.



8 Drill to Entertain Kids. Watching dogs or rabbits chase each other along the drive cord of a dentist's drill would help to calm jittery children—and perhaps grownups. To be made of thin sheet rubber and wired to the cord, each toy animal would take the turns around pulleys in its stride.

5 Flashlight to Power Fan. Substituting a small attachment for the lens, lamp and reflector of an ordinary flashlight would provide a pocket-size electric fan for hair drying or just cooling off. A midget motor, powered by the regular batteries, would spin a tiny fan blade within a perforated cover when the light switch was pressed.



6 Dish to Cut Butter. This handy dish of glass or plastic is intended to keep butter in the refrigerator—and then to slice it in the kitchen or at the dinner table. A cutting wire in the hinged cover would make the slices, their thickness depending on how far out the sliding tray carrying the butter was pulled.

9 Curtain to Soften Crashes. A sponge-rubber mat that would whiz across windshield and instrument panel could save a car rider from injury when hurled forward in a crash. Springs would eject it when any one of five electric switches, responding both to direct impact and sudden deceleration, actuated a trigger.

Patents on these inventions have been granted to: 1. A. Holmdahl, Kellogg, Iowa; 2. W. Peck, Detroit; 3. W. and G. Stilwell, Vermillion, S. D.; 4. P. F. Calihan, Red Wing, and S. A. Mortenson, Minneapolis, Minn.; 5. J. E. Popovich, Oakland, Calif.; 6. C. W. Paul, NYC; 7. J. D. Caslor, St. Vital, Manitoba; 8. C. J. Gardetto, Milwaukee; 9. A. B. Joncas, Detroit.

Super Service for Truckers

This enormous service station for trucks, 112 miles north of Los Angeles, covers 10 acres.

The world's biggest roadside stand for the care and feeding of freight haulers and their drivers grosses $2,000,000 a year.

A COUPLE of fellows with a shrewd appreciation of human nature have parlayed a towel and a bar of soap into the world's biggest service station for trucks.

If that's stretching the truth a bit, it's only because the towel and soap are first on the list of services supplied to truck drivers who roll into their 10-acre, million-dollar establishment on Highway 99 on the outskirts of Bakersfield, Calif.

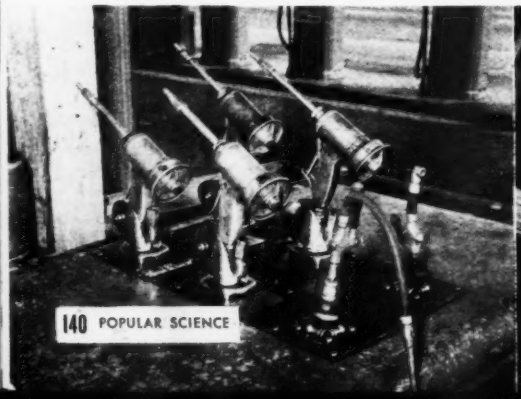
Walter Jaynes and Dick Stricklen, the owners, figure that a free bath for their customers is one of their big assets. It's one of the reasons they dispense 200,000 gallons of fuel a month and bank $2,000,000 a year. Truckers, dog-tired and dirty, get a bath—and far more.

Take gearjammer Paul Hendricks. He air-brakes his 50-foot-long truck-trailer to a halt between two rows of fuel pumps.

"Gimme the works," he says. "Got to be rolling in a half-hour."

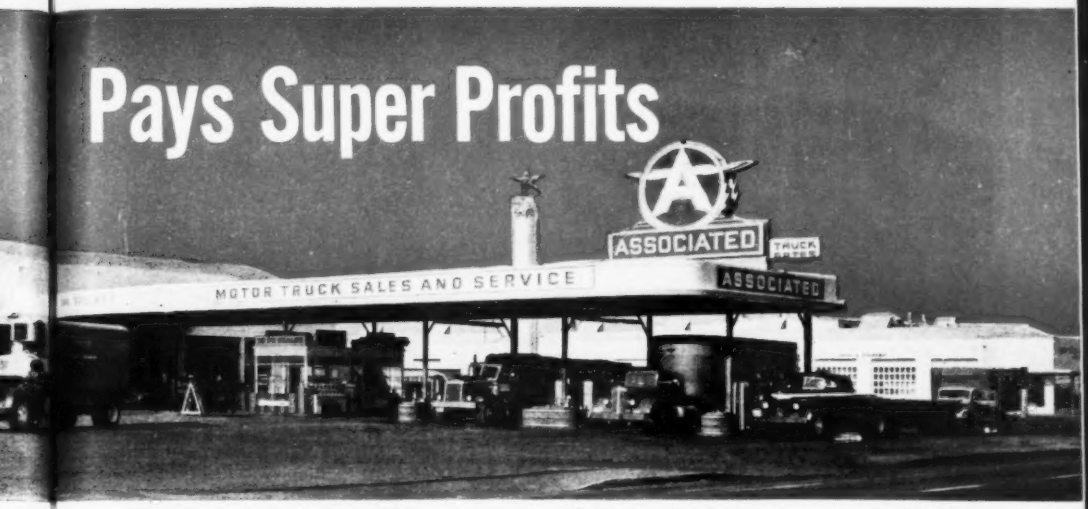
An attendant hands him towel and soap. He points toward the shower room, then in the direction of a spick-and-span coffee shop. As Hendricks steps out, three men jump to their jobs servicing the truck-trailer. Two of them feed 110 gallons of Diesel fuel into tanks on opposite sides of the truck. A third pours five quarts of lube oil into the

OILERS **Four grades of lubricating oil are pumped at 150-lb. pressure. Outlets in foreground carry oil, water. Station has two such systems.**



CALL BOARD **No need for a trucker to take off empty. Part of service is passing business tips on to the customers.**

Pays Super Profits



Heated in winter and cooled in summer, it sells fuel and oil, makes repairs, builds bodies.

engine, washes the windshield, brushes out the cab and thumps all the tires with a tire iron to test for flats.

Before Hendricks has completed showering, one of the uniformed attendants drives the big rig over a lube pit, where grease is squirted into the fittings.

Twenty minutes from the time Hendricks spotted the station's neon signs, the rig is ready to roll on. As he unpeels a roll of bills, the night manager says, "I see you're from Florida. Better look at the bulletin board before shoving off."

Bulletin Board Pays Off

At one end of the pump island a notice is chalked on a blackboard: "Load of grapes for Miami." And so Hendricks, who has hauled a load of molasses across the continent, gets a profitable return load—all for free.

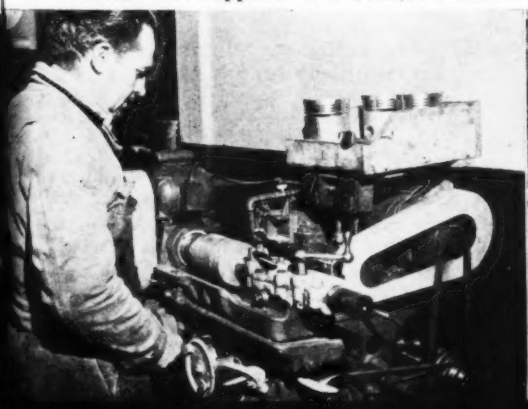
The station, called practically, if unromantically, Motor Truck Sales and Service, is only a little more than seven years old. No longer ago than 1945 Jaynes and Stricklen took note of an interesting fact—each 24 hours 2,000 trucks were rolling by Bakersfield, on the main route between Los Angeles and San Francisco. During the peaks of cotton, produce and fruit harvesting, par for the day reached 4,000.

And nowhere on that stretch of highway was there a service station devoted exclusively to trucks.

The partners were savvy. Jaynes had taken over the management of his father's Bakersfield garage when he was graduated from the University of California. Stricklen

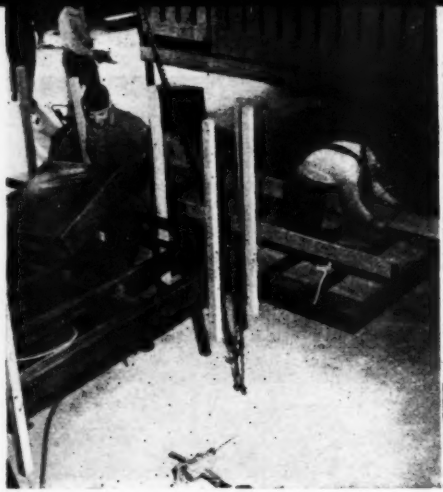
MACHINE SHOP

Emergency parts for ailing trucks can be made or supplied from $100,000 stock.

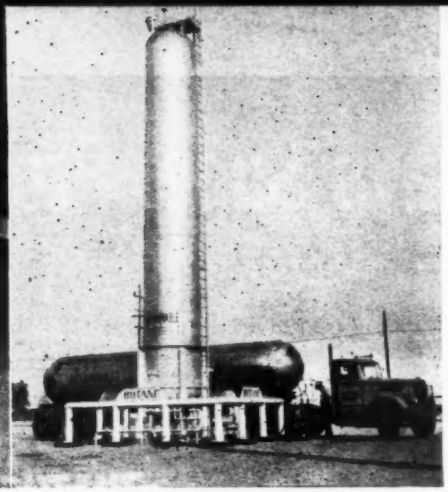


PAINT JOB

Trucks and trailers can be painted by spray-gun method and then dried quickly in constant-temperature oven.



CUSTOM CUT **Bodies are built to order to fit customers' trucking needs. Special job above is for a light truck.**



BUTANE **This 10,000-gallon, 60-foot butane tank fuels trucks at 40 gallons a minute. Set vertically to attract attention, it weighs 17 tons.**

had sold automobiles—including that mourned vehicle, the Peerless—since the year 1924.

They mapped a 10-year building program. They bought 10 acres of ground with 600 feet fronting on the highway and optioned 88 more for expansion.

But not one spadeful of earth was turned for six months. The two men took off on a tour of the United States to see how other people serviced trucks. They separated so that they could cover more territory. In all, they visited 150 service stations.

Back home they compared notes. Not one station visited had been laid out specifically for the most efficient handling of big units.

They knew what they had to have: fast, friendly service, a better-than-average restaurant, machinery and tools to repair breakdowns, enough room to drive the biggest truck into any of their buildings without backing to maneuver, free help in getting revenue loads for truckers and—for the drivers—soap and towels.

Room Enough for Everybody

The planning has paid off. Business is booming. In the gas island is a scale that can take a truck 70 feet long. The nearby lube building is cocked 15 degrees toward the fuel island. That's so the longest rigs can go from the pumps to the grease pit without backing up to maneuver. Twin pits are each 70 feet long. Trucks can swing into the other service buildings going away, as the saying goes, and move right out the opposite side following repairs.

On the back lot stands a trouble truck to help truckers—and farmers, too—when they have breakdowns. In a vault are thousands of dollars in cash—customers often want to cash checks.

Nights Are Busy

The $6,000 a day that goes into the till isn't all from servicing combos. The partners also sell two makes of trucks, farm tractors, cotton pickers and hay balers. And they build bodies. Doors are open 24 hours a day. You can buy gas or gaskets at three in the morning. Most of the business, in fact, is done at night.

The station is known from coast to coast and even abroad, but Jaynes and Stricklen are still looking ahead. By interviewing state engineers, they learned that highways and bridges are being beefed up. That means that bigger trucks and heavier loads—existing California laws limit trucks to 60 feet and 76,000 pounds on six axles, highest in the U. S.—are coming.

The place on Highway 99 started getting ready for them years ago. END

Use of Titanium Saves Chromium

SUBSTITUTING titanium for stainless steel in one jet engine saves enough chromium to finish the radiator grilles, bumpers and trimmings of 33 automobiles.

Recognize this Chevvy? It's now mostly Olds with parts of an 88 and a 98 fitted in the body.

Olds Makes Old Chevvy New

ONCE upon a time this car was a 1949 Chevrolet—a two-door Styline sedan. Now, $1,500 later, you can't identify it. But if you scratch beneath the surface of the purple and off-white paint job, you'll find a patchwork of new parts lifted from an 88 and a 98 Olds.

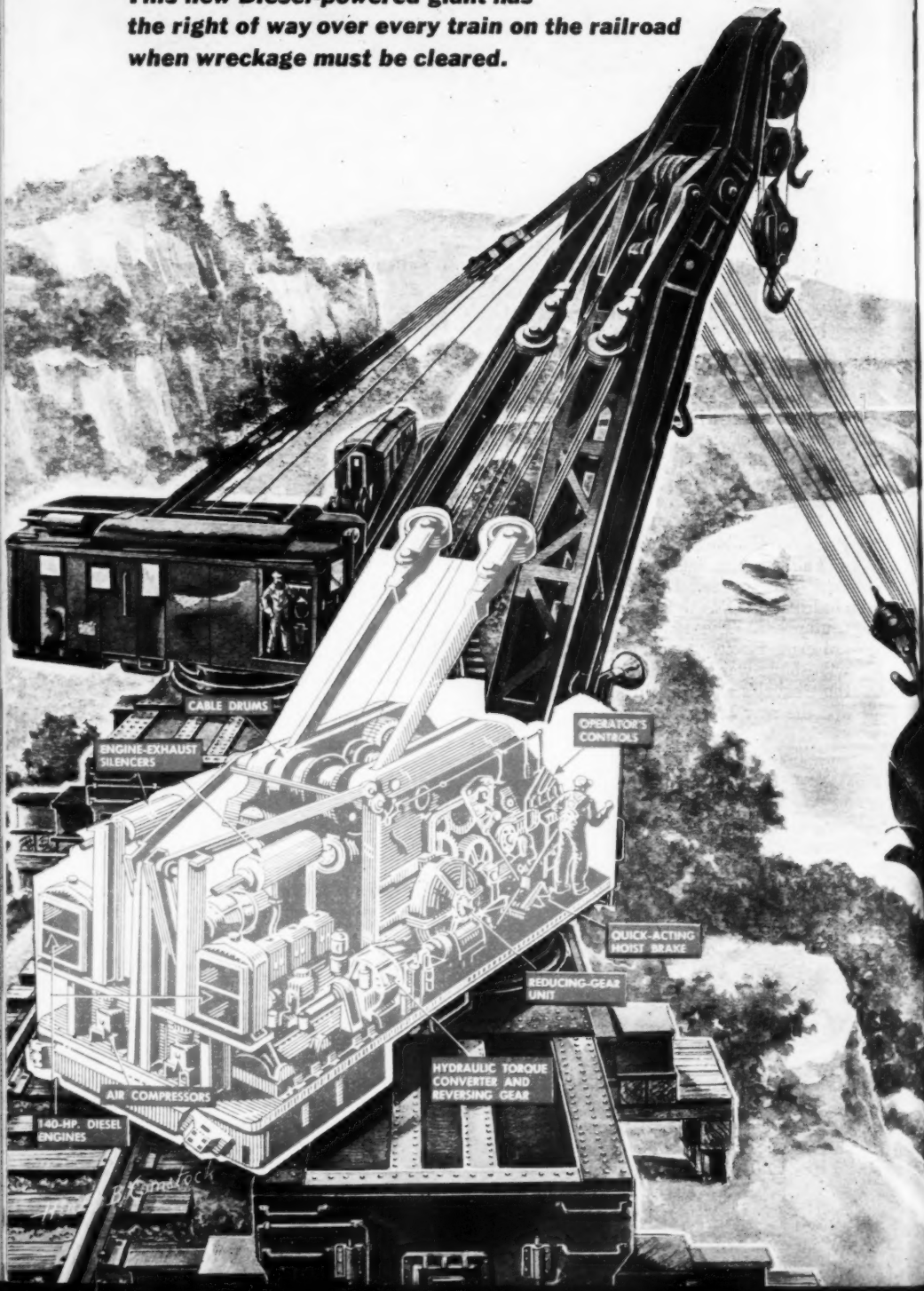
George Cerny of Los Angeles, who makes a business of glamorizing low-priced cars to make them look like what they ain't, did the job. He lowered the top three inches and added three inches to the bottom of the skirt and fenders. The revamped grille includes a '50 Olds top bar and a '51 floating center bar. The lengthened rear fenders are part Chevvy, part Olds 88, and the windshield was swiped from an 88. Most of the Chevvy's chromium trim was eliminated and the new hub caps were specially made.

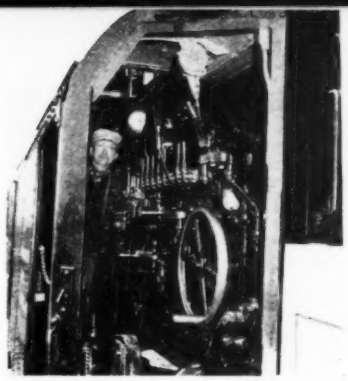
DECK LID of Chevvy has been squared off by reshaping original. Rear fenders are longer.

New Lightplane Is All-Metal

BILLED as the world's first all-metal, single-place flying flivver, the new Honey Bee (above) is 17 feet long, has a wing span of 28 feet, and weighs only 550 pounds. The 65-hp. lightplane is said to take off at 45 m.p.h., climb 1,100 feet a minute, and hit a top speed of 120 m.p.h. Beecraft Associates, San Diego, will also supply the airframe only and fit it with your own engine.

This new Diesel-powered giant has the right of way over every train on the railroad when wreckage must be cleared.





COOL in summer, hot-water heated in winter, the Diesel-crane engineer's cab is comfortable. Controls duplicate those of steam hooks.

The Crane That Saves $2,000 a Minute

By Henry B. Comstock

WHEN a busy main line is tied up for as much as three hours by a train wreck, any additional delay may set a railroad back as much as $2,000 a minute in lost revenues.

That is why a modern, high-capacity wrecking crane, which costs as much as a two-unit Diesel engine, three luxury-train diners or four streamlined roomette cars, is considered a sound investment. Brass hats who expect 23-hour-a-day service from their locomotives do not object to footing the bill for this "Big Hook's" maintenance, even if it goes from one year to the next without once hoisting a boxcar out of the ditch.

The "wrecking train" which includes this big crane should really be called a re-railing train. It looks like a saw-toothed tramp, with its dingy old crew cars and flatcar loads of replacement parts. But when a terse "W-K" (wreck) signal crackles over the dispatcher's wire, it suddenly becomes a prince in rags, with running rights over all trains, including the road president's private buggy.

You might expect some day to see it roaring over the rails at top speed. But fiction writers to the contrary, it rolls along at a conservative 45-mile-an-hour gait. Anything faster than that would be an invitation to double trouble, for in spite of good design, the hook is an unwieldy machine.

The wreckers rank second only to locomotives in dramatic appeal. Yet public relations' men clam up like a delegation of Russian diplomats when asked about their lines' wrecking trains.

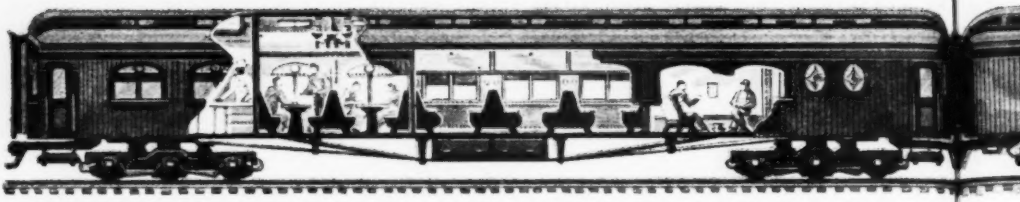
BACK ON THE RAILS goes a smashed locomotive, lifted by the carefully coordinated efforts of two cranes (drawing shows one in cutaway view to indicate the working parts).

Wrecks Are Too Obvious

As one of them put it when I tried to crawl under the iron curtain of reserve:

"We pay a cockeyed price for running the world's safest transportation system. It all boils down to 'Iron horse bites man—that's news.' As a result, a railroad gets a million dollars' worth of damaging headlines whenever a train takes to the tall corn.

"Even the life-protecting strength of our equipment works against us. You can mop up the worst automobile smash in a matter of minutes. A shattered airplane on a mountain top is hard to photograph. A sinking ship soon disappears. But when our heavy steel cars leave the rails, it may be a couple of days before the wrecking gang gets the



WRECKING CREW CAR provides office, bunks and dining quarters for the wrecking boss and a crew of 12. From its kitchen come the best meals served anywhere on the railroad.

landscape back to normal. Meanwhile, we have a Cecil B. DeMille extravaganza on our hands, and it's generally strung out for half a mile beside a crowded highway."

I was frankly surprised when he gave me clearance to talk with veteran wrecking boss Bill Tracy. The only stipulation was that I not name the railroad he serves.

Tracy proudly showed me his brand new Diesel crane. It is a robot weight lifter measuring more than 70 feet from its rear coupler to the tip of its lowered boom. A giant which, at the touch of a lever, can just about lift the heaviest passenger locomotive ever built. The railroad's initials are neatly stenciled on it, but you could admire this crane for hours without noticing them.

A Foreman's Dream

I am fairly familiar with steam-powered cranes, but this Diesel was an eye-opener to me. A product of Industrial-Brownhoist, it has practically revolutionized the railroad-crane-building industry. Although this 250-ton-capacity Diesel job was introduced only four years ago, you'd need a special order to buy one of the old flame throwers now.

Tracy's explanation is simple.

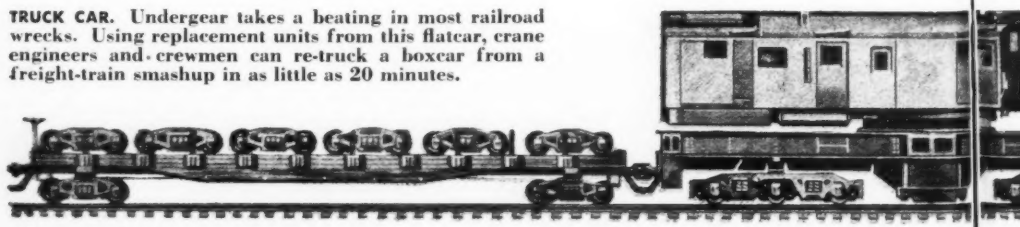
"This Diesel," he told me, "is a wrecking foreman's dream come true. Time was, and not so long ago, when we kept an engineer puttering around our steam hook all the time—shoveling in coal, cracking up clinkers, patching leaky flues and trying to keep the pipes from freezing in winter. Hard water gave us plenty of trouble, too, even with chemical treatment. Then, when the division switched over to Diesel locomotives, handling coal for the hook became a special problem. But all those standby losses went out the window when we got the Diesel."

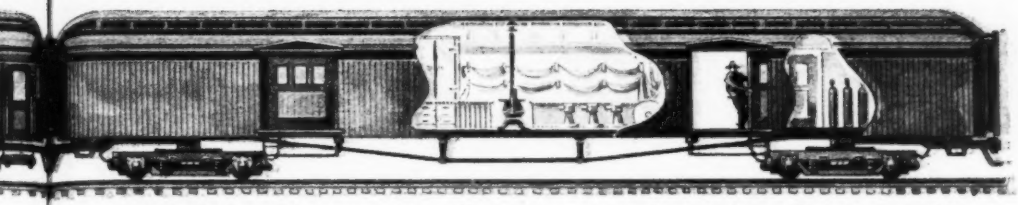
"How about starting those big engines on a cold night?" I asked him. "I see you don't keep them idling."

"Easy enough," he grinned. "Notice the plug-in stations on the side of the cab? When the temperature starts to drop we hook them up to a 115-volt power line. One circuit feeds a 500-watt heating unit under the oil pan on each engine. The other goes to a ring heater coiled around the bottom of the fuel tank. That keeps the oil thin, and we can kick a unit over as fast as you can start your car in a heated garage."

Climbing into the operating cab, I saw that the controls differed very little from those found in the earlier steam models. There were the usual levers, wheels and foot treadles. They swing the cab through a complete circle, eliminating turn-arounds; raise and lower the massive boom; hoist any one of four hooks hung at intervals along the upper length of the boom; apply positive braking at the cable drums; and inch the crane along at a three-mile gait when it is operating independently of the wrecking-train locomotive. Even the jack beams—giant telescoping arms which are drawn outward from the frame of the crane car and blocked up with timbers to provide a widened base for the crane when it is hoisting heavy loads—are operated remotely.

TRUCK CAR. Undergear takes a beating in most railroad wrecks. Using replacement units from this flatcar, crane engineers and crewmen can re-truck a boxcar from a freight-train smashup in as little as 20 minutes.





TOOL CAR contains more than 750 items, ranging from a quarter of a mile of rope to a portable telephone. It is also a mobile machine shop, for making on-the-spot repairs.

But the similarity ended there. The day Tracy showed me this crane, the thermometer outside the yard office hit 90°. In such weather, the heat under the low roof of a steam crane would have been almost unbearable. Yet I noticed little difference in the temperature inside this crane's cab.

My next question was not too bright.

"With a hook like this, and a veteran crew," I said, "how long would it take you to whip the average freight car out of a wreck and set it on a new pair of trucks or on the deck of a flatcar?"

Each Wreck A New Challenge

"That," he told me, "is like asking 'how long is a piece of string?' I've never seen two cars, or two wrecks, which could be handled exactly alike. Sometimes a load is impossible to handle with a direct haul. In that case we bury a heavy timber—a 'deadman,' we call it—deep in the earth, anchor a sheave, or pulley wheel, at its center, and pass a line from the car through the sheave and back to the crane hoist. Getting set for an indirect pull like that takes a lot of time. But you could say we hold the time for most hoists to 20 minutes per freight car.

"Passenger equipment? That's something else again. There you are dealing with expensive stuff, and the brass doesn't like to have it tossed around."

"How about locomotives?" I asked the big Irishman. "Seems to me I saw a picture, once, of five cranes hoisting a freight engine out of a gully."

Cranes Come 400 Miles

"That might well have been our wreck at ————," Tracy nodded. "We brought in the hooks for that headache from division points as far as 400 miles away. Took us some time to get a footing of piles and timbers under our outriggers. But when we were finally ready, four hoists, in as many hours, saw that Mallet engine up 50 feet of a 40-degree incline and onto the rails again.

"You might ask why it took five cranes with a combined lifting capacity of 1,250 tons to handle a 300-ton locomotive.. The answer is that you can't always have the booms drawn up to their shortest radius and working on a load that is directly under them.

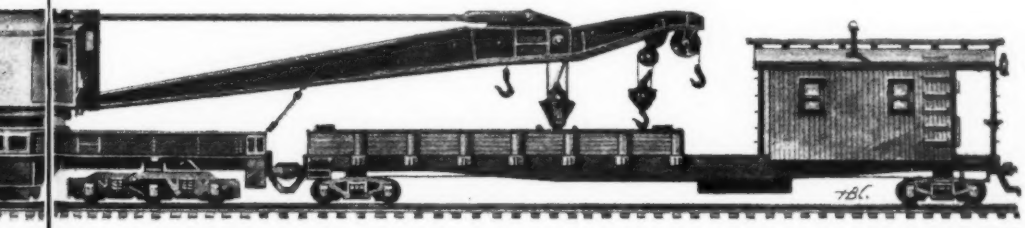
"With this crane, for example, we get our maximum lifting capacity when the main hoist is 17½ horizontal feet from the pivoting point of the cab. When you lengthen that radius to 26 feet—and you don't have to lower the boom very far to get there—its effectiveness is cut exactly in half."

"Do the cables ever snap?" I doubted whether he would answer this one.

[*Continued on page 254*]

250-TON CRANE has cab set far back on its bed plate to counterbalance weight being hoisted. Four hooks handle everything from locomotives to divers trapped in quicksand.

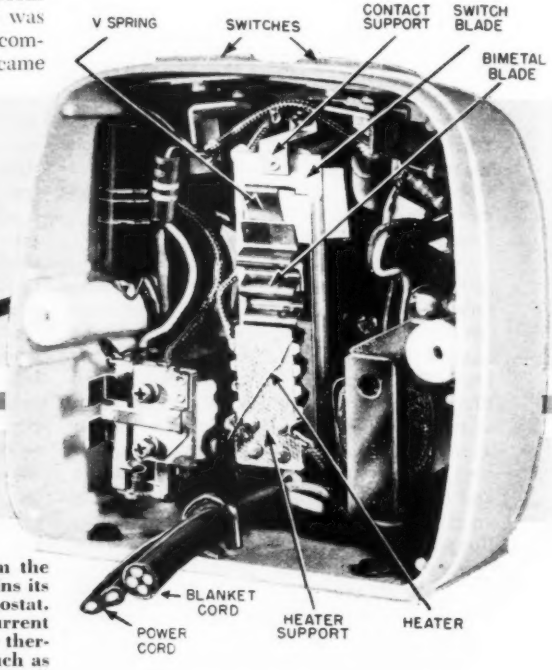
At right below is the idler car, which provides a protecting platform for 30 feet of projecting boom when the crane takes to the road. Shelter at the rear is pint-size caboose.



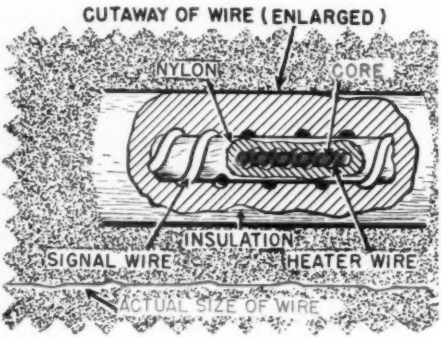
How Electric Blankets

THE grandpappy of the electric blanket was an electrically heated flying suit that didn't work. There wasn't anything wrong with the suit itself—it was developed during World War I and the planes of that day couldn't provide enough juice to keep it warm.

Extending this idea to blankets may seem like a simple step, but not until 1936 was the first electric blanket offered, to a completely unenthusiastic public. Then came World War II. Millions of electrically heated casualty blankets and flying suits—that did work—were used, the manufacturers learned some new tricks, and the public's attitude changed. Now the blankets are displayed in a wide variety of types on department-store counters from coast to coast.



THIS BEDSIDE CONTROL knows how warm the blanket is keeping you because it contains its own heating element attached to a thermostat. Current flows in this heater whenever current flows in the blanket wires, warming the thermostat at the same time and just as much as the blanket warms you. The control will maintain temperature to within one degree. At setting 5, it will turn current on if the temperature falls below 71°, shut it off at 72°.



INGENIOUS SAFETY DEVICE to prevent overheating is built into the wire of General Electric blankets. It makes use of the way nylon's electrical characteristics change with temperature: nylon, normally a good insulator, will let some current pass when it gets hot. GE's heater wire (right) has a nylon jacket around which is coiled a "signal wire." If the heater-wire temperature exceeds a safe limit, the nylon jacket's electrical impedance will drop enough to let current leak to the signal wire, and thus to a relay that turns the blanket off.

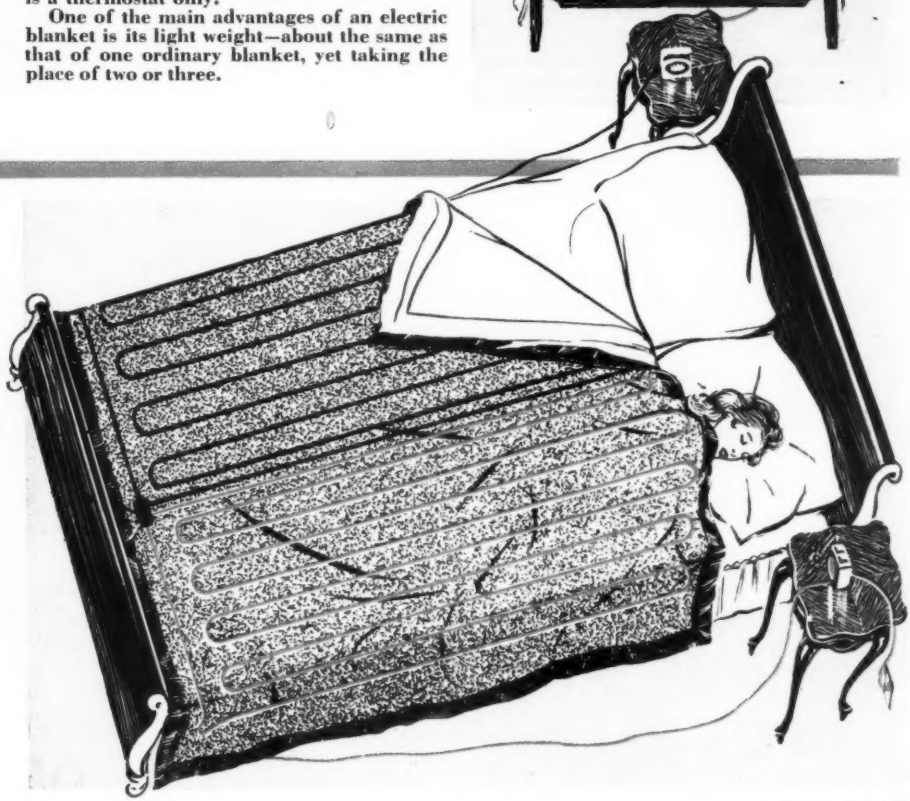
Work

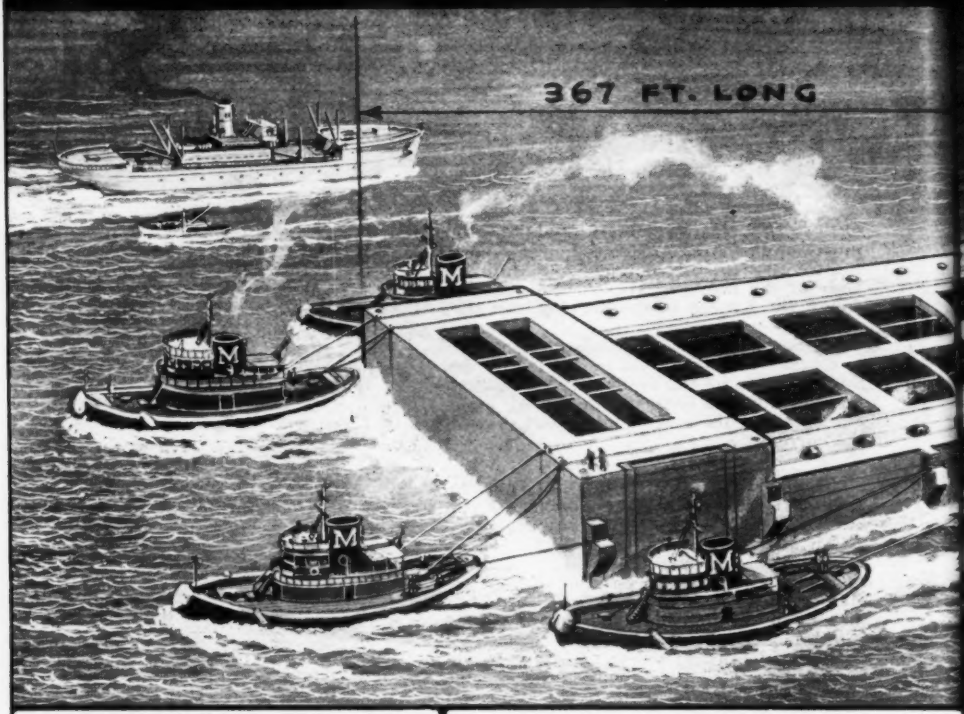
SINGLE-BED ELECTRIC BLANKETS **(right) are the most popular size. The fine, highly flexible heater wire lies in channels sewn into the body of the blanket. The channels roughly follow the pattern in the drawing, but they are invisible.**

Users are warned not to place the control box near a radiator or an open window, and not to double up the blanket or pile pillows on it, for that will cause it to get unduly hot in one spot and the safety device will shut off the current.

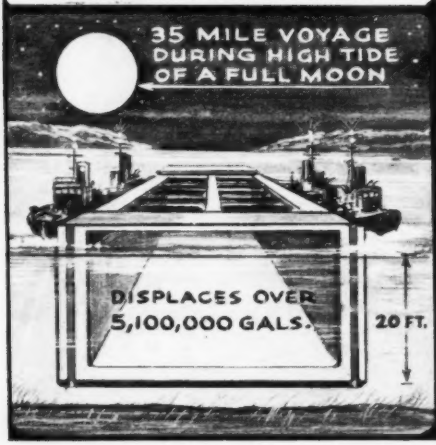
HARMONY IN A DOUBLE BED **is possible with an electric double blanket, which provides separate heating circuits and controls for its two halves. There is a slight hitch, though. Whoever handles the master control, shown near the occupied side of the bed below, can shut the current off altogether. The other control is a thermostat only.**

One of the main advantages of an electric blanket is its light weight—about the same as that of one ordinary blanket, yet taking the place of two or three.

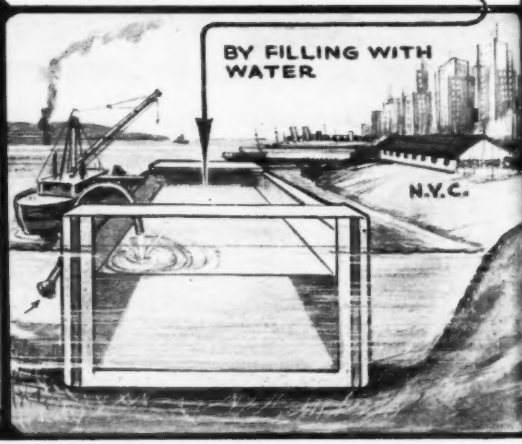




1. SAILED TO LOCATION.

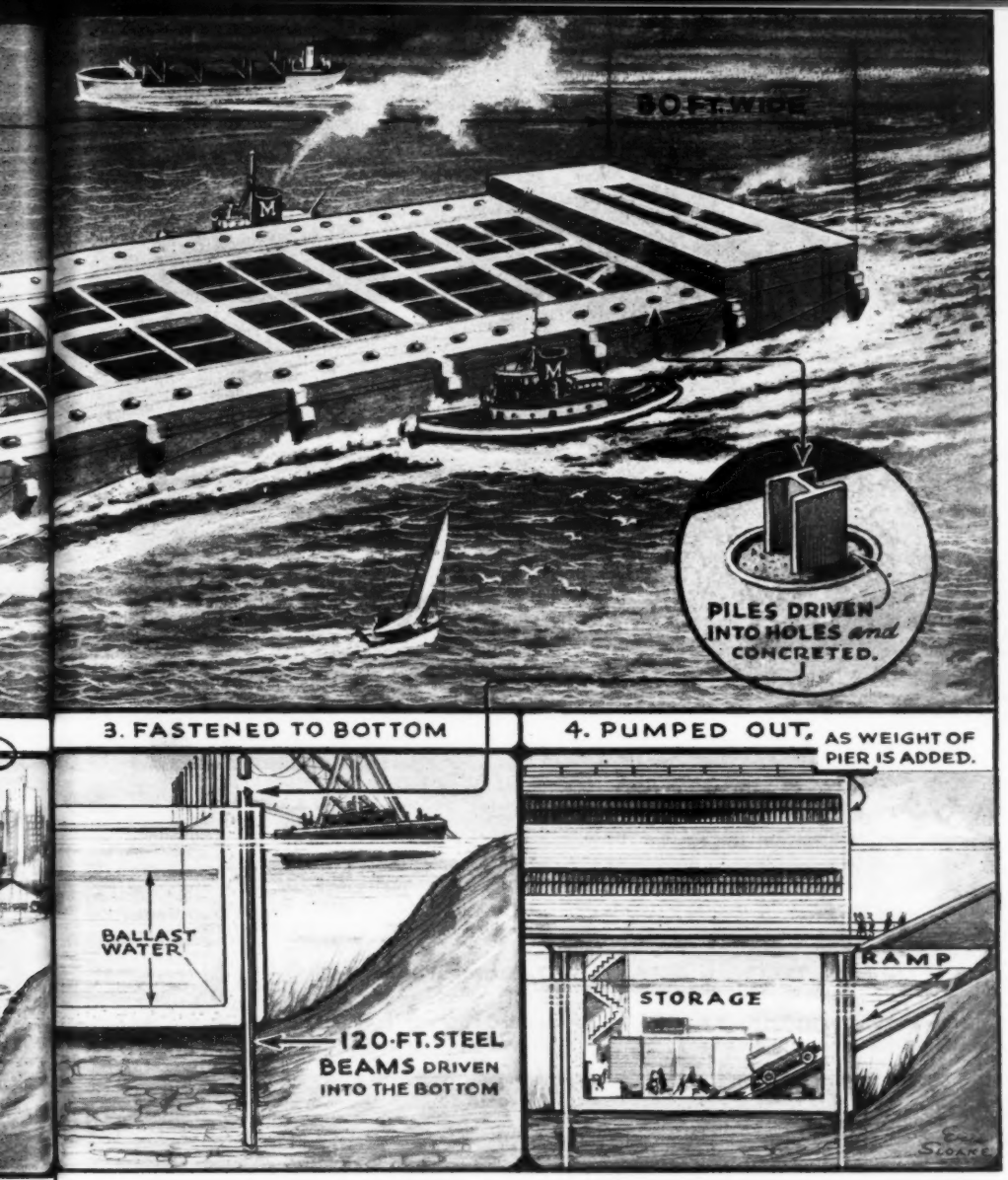


2. SUNK INTO POSITION

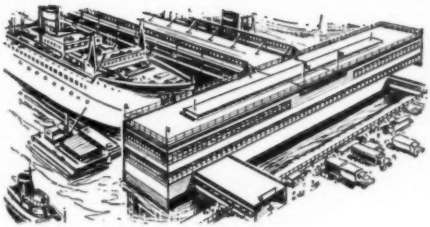


How N. Y. Pier Rode 35 Miles to Its Berth

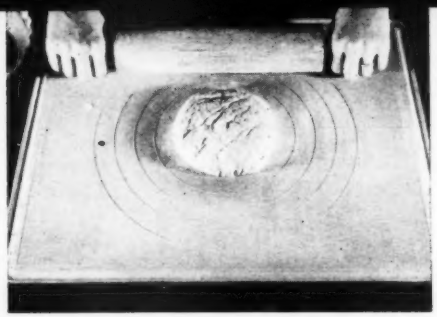
THE strangest craft ever to sail the Hudson were three huge, rectangular concrete-and-steel caissons that were floated 35 miles downriver recently to form the foundations and basement of New York City's newest and most unusual steamship pier. They were built in an abandoned clay quarry, to which the river was then admitted by knocking out a 50-yard-wide wall.



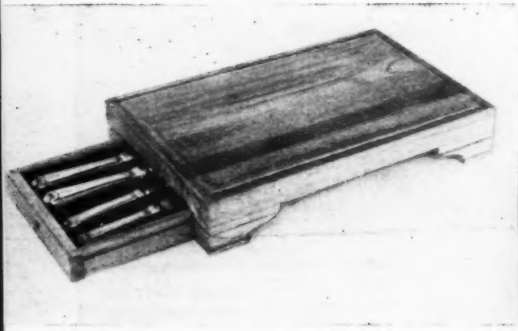
Each section of the fireproof, borer-proof, prefabricated pier was hauled separately to its New York City location at the foot of 15th Street. There the three caissons were assembled in the shape of a T with its head against the shore. The drawings above show how the first unit of the pier was moved to its destination, how it was anchored and how it will be used.



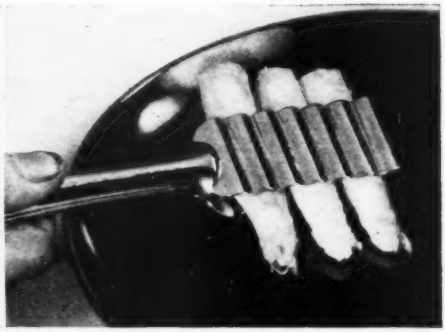
What's Cooking for Cooks



1. Pastry Tray. A rubber tray with a cloth-like texture takes the place of the old pastry board and cloth cover. Concentric circles make it easy to gauge size of crust.



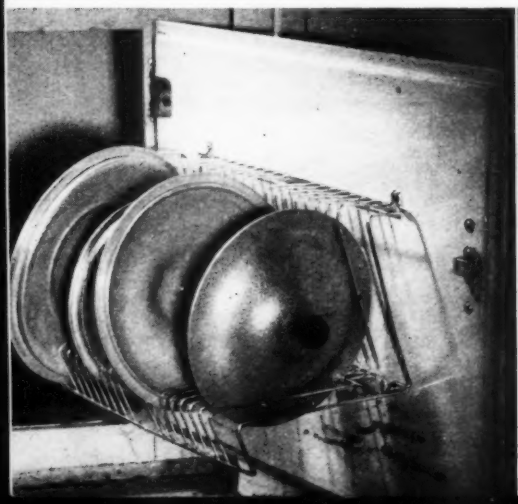
3. Meat Carver's Toolbox. When you bring this carving board to the table you don't have to search out the carving tools. A built-in drawer holds the cutlery.



4. Food Server. Chromium-plated tongs are fluted to grip asparagus, sausages or whole carrots. They will lift flat foods like meat patties, too.

Further information on these products can be obtained from: 1. Wooster Rubber Co., Wooster, Ohio; 2. Live-Pak Corp., 35 India St., Boston 10; 3. Richard Auldridge, Box 12, Ridgeway Station, Stamford, Conn.; 4. Heller Hostess-Ware, White Plains, N. Y.;

6. Pot-Lid Rack. Lid-Crib is designed to hang on a door or stand on a pantry shelf. There's a similar wire crib for metal or glass pie pans and ovenware.



7. Butter Warmer. When a lighted candle is placed under this sauce boat, its cargo—melted butter, hollandaise, hot fudge or gravy—will stay hot throughout the meal.

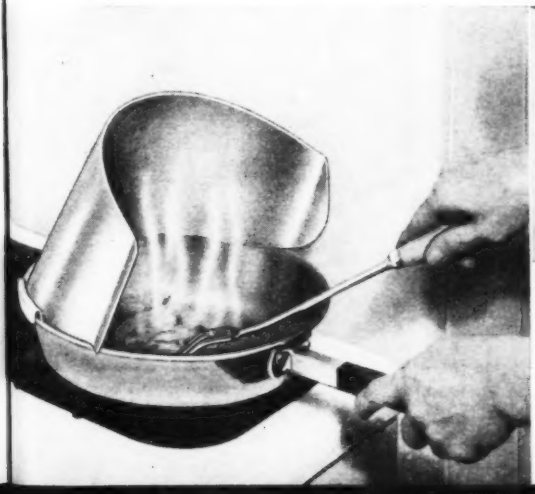
2. Lobster in Cans. Boston fishermen are sealing wriggling lobsters into cans now. You order them direct from the packer, specifying the date you want them. When the can is opened on arrival, out crawl two lobsters, alive and kicking.

5. Four-Sided Sink. This center-of-the-floor sink lets the housewife walk all around it and use it from all four sides, saving many steps.

The Midway, a double sink mounted on a steel cabinet, measures 44 by 37½ inches.

5. American Radiator & Standard Sanitary Corp., Pittsburgh 30; 6. Elgin Novelties, Provincetown, Mass.; 7. Susi Press Co., Whitinsville, Mass.; 8. Wilco Products, Box 905, Louisville, Ky.; 9. International Allied Industries, Hialeah, Fla.

8. Grease Guard. Fitted on any nine- to 12-inch skillet, this shield leans inward over the pan to catch spatters. It also can be placed on the stove around smaller pans.



9. Egg Poacher. Lowered into a skillet of water on this tray, eggs are poached in four watertight rings. Once cooked, it's no job to get them out of the pan.

Nylon-Glass Armor Saves American Lives

Enthusiastic reports from Korea say 8-pound vest of plastic— tougher than ancient coat of mail— cuts battle casualties in half.

By Thomas R. Henry

A NEW knight in armor is appearing in battle—the American infantryman.

The soldier with war's most dangerous and essential job is going into conflict with almost his entire torso covered by a relatively light vest made of glass fiber and nylon. It will effectively stop more than half of the missiles that normally cause battle wounds.

He doesn't look much like Sir Galahad or the Chevalier Bayard—but Galahad or Bayard encumbered by their 40 or 50 pounds of hand-wrought steel wouldn't have lasted long under a mortar barrage in Korea's icy mountains.

The looks of the new mailed soldier, in fact, don't differ materially from that of the infantryman of the last war, except that he seems a little bulkier around the chest and stomach.

This armor is not absolute insurance against death in battle, but some of the more enthusiastic advocates estimate that it

Wearing new body armor, machine gunners of First Marine Division fire on enemy in Korea.

Knocked down but unhurt, Marine in Korea shows shrapnel piece stopped by armored vest.

may reduce combat deaths and serious wounds as much as 70 percent.

The most whole-hearted armor advocates are the Marines. Their enthusiasm is based on actual combat experience. The Corps has a slightly different type of armored vest from that of the Army, although the principle is the same. It was developed at the Naval Medical Field Research Laboratory.

Most Wounds from Fragmentation

The Marine armor is a sleeveless vest reaching below the waist, with a zipper in front. It weighs 7¾ pounds. The protection comes from contoured, overlapping plates of plastic, laminated glass fibers and a multi-layered nylon fabric.

This armor is not bulletproof in the sense that it will stop a rifle bullet at close range. But relatively few casualties in battle are caused by rifle bullets. It stops .45-caliber bullets from pistols or Tommy guns and fragments from exploding shells, which travel comparatively slowly. At least 70 percent of World War II battle wounds were caused by fragmentation ammunition.

Some of the estimates for Korea are astounding. Maj. Gen. John T. Selden, commander of the First Marine Division, says that in one action the number of dead would have been quadrupled had it not been for the vest. Navy Capt. Louis P. Kirkpatrick, the division surgeon, estimates that the vest has been 90 to 95 percent effective in preventing wounds of the torso, which previously suffered approximately 80 percent of all wounds.

A typical experience was that of a Marine private hit in the chest with a four-inch-square chunk from an 88-mm. mortar shell.

"I was just knocked to the ground with great force and had the wind knocked out of me," he says.

Another Marine lived despite a close

mortar blast which embedded 41 fragments in the armor.

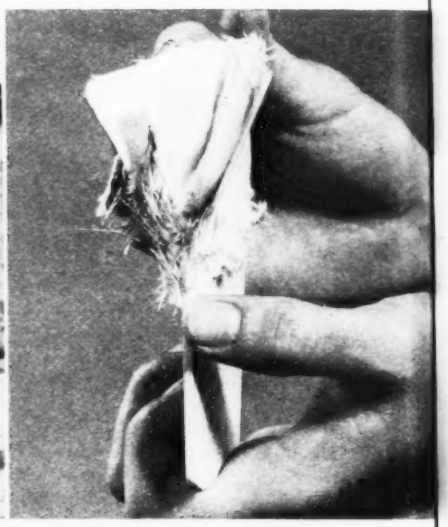
This, of course, is not the whole story. The Army is not entirely committed to armor of any kind. Some of its problems were discussed before the American Medical Association a few weeks ago by Lieut. Col. Robert H. Holmes.

Use of Armor Poses Weight Problem

Two trends conflict, he explained. In modern warfare top priority, especially among Americans, is given to speed of maneuver. This has led to all possible efforts to reduce the weight carried by the infantryman. At the same time there has been a tremendous increase in firepower, in which shell fragments are a more and more important element. Some compromise must be reached between the two opposing trends.

Armor of a less efficient type than that now proposed was standardized by the Air Forces during the last war. It was 50 percent effective in preventing injuries. Weight, however, is not so important to air crews.

Army experiments are being conducted at the Army Chemical Center at Edgewood, Md., with a somewhat lighter combat vest. The results, Colonel Holmes said, "are encouraging." Enormous strides in combat medicine and surgery have reduced the death rate among men wounded in action in Korea nearly 50 percent below that of the Second World War, he explained, adding that this advance soon will meet a saturation point, where very little further reduction can be expected from medicine alone, and more attention must be given to quick evacuation by helicopter and to body armor to prevent wounds. END



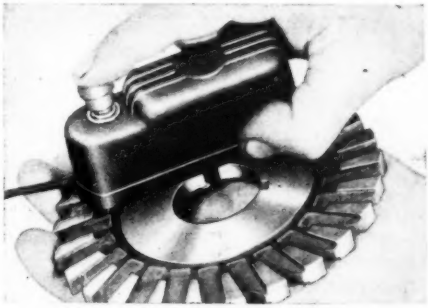
HOW NEW ARMOR STOPS BULLETS: Demonstrator at left above fires .45-cal. submachine gun point-blank at dummy wearing Marine Corps armored vest. Photo at right shows nylon-glass armor plate shredded but not penetrated by bullet. Below, three flattened .45-cal. slugs removed from vest after trial are contrasted with original slug (left).

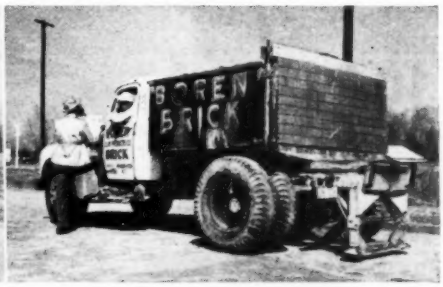
Boat Skims Over Water Like Plane Rides the Air

HYDROFOIL "legs" on this motorboat lift it about 18 inches above water while an extra-long drive shaft on the outboard motor keeps the prop under water. Water flowing over the hydrofoils lifts them the same way air lifts a plane wing. The boat is said to skim along at 35 m.p.h. with motor at half throttle, turning safely without slowing and with little banking. The Baker Mfg. Co., Evansville, Wisc., makes the hydrofoils.

Demagnetizer Is Portable

TOOLS, dies and parts are demagnetized just by sliding over them the electrical instrument shown at right. Three poles of laminated silicon steel are mounted in the plastic case, flush with the bottom surface. When the switch is pressed, the current is closed, setting up a field which neutralizes magnetism. Releasing the switch automatically shuts off the unit. The Enco Mfg. Co., 4520 W. Fullerton Ave., Chicago 39, makes the Miti-Mite.





Rig Loads Truck in Six Minutes

WITH this setup, T. H. Holt of Greensboro, N. C., gets bricks aboard his trucks five times faster than by hand loading. The steel frame (left above) is placed over 3,000 specially stacked bricks and its sides are squeezed tight against the bricks by hydraulic pressure. The solid 14,000-pound mass is lifted into position by a hydraulic cylinder operating on a power take-off. After the rear support is folded up (right above), the loaded Ford is ready to roll.

What Jets Have Done to Our Air Power

In 10 fast years, these engines have thrust speeds and altitudes farther into the "wild blue yonder."

By Herbert O. Johansen

TODAY America is well on the way to having an all-jet Air Force. Yet it was just 10 years ago this month that the roar of America's first jet airplane was first heard over the desert of California's Muroc Dry Lake.

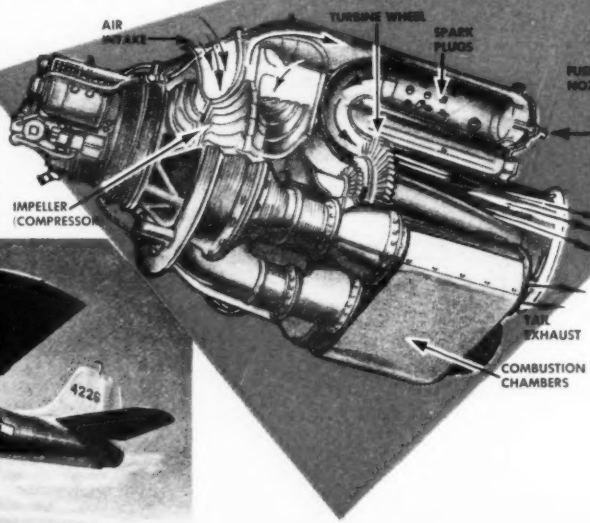
In 10 years, jet engines have almost doubled the top speed of our fighters. Only a few years ago it was generally believed that no human being could fly through the sonic barrier and make a happy landing. Now it is routine for Air Force pilots to pass that barrier and fly faster than sound.

Jet power also has enabled our pilots to ascend 45,000 feet, into the stratosphere. And they can climb there almost straight up—at speeds unheard of when World War II broke out—to intercept enemy planes before they reach their targets.

The attainment of such speeds and altitudes, however, has posed problems, and these problems have brought about changes in planes which are almost as startling as the new power plants. Needle-nosed shapes and swept-back wings have become commonplace. Cockpits now are air-conditioned against extreme heat at low altitudes and extreme cold at high altitudes. The pilots' seats have to be ejected automatically in emergencies. Rear-released parachutes are used as brakes for hot landings. And the electronic equipment of a jet would give a World War II pilot who was suddenly placed in such a plane for the first time the screaming meemies.

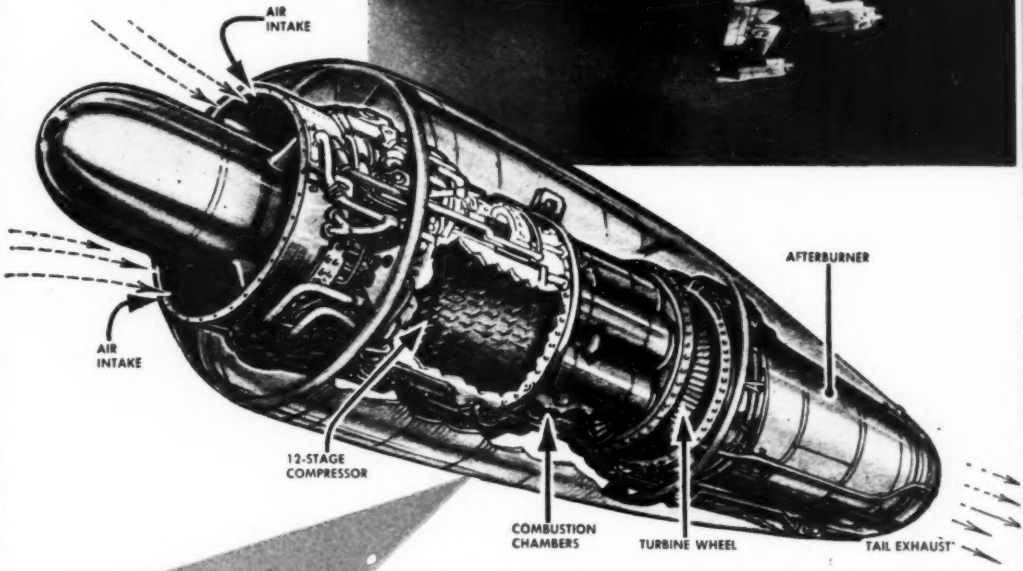
Jockeying a hot fighter plane used to be considered a young man's job, because a person's reflexes and reactions slow down shortly after he passes the voting age. In World War II, the average age of pilots was 24 years. How were you going to get them any younger?

That question is academic now. The average age of jet pilots today is 30 years—



1942 ORIGINAL U.S. jet engine, the I-A (right) was developed by GE from study of pioneer British Whittle engine. Two of them powered P-59 Airacomet (below), first jet airplane to fly in this country. It had 1,300-pound thrust, 400-m.p.h. speed.

1952 TODAY J-47 jet engine (below), with more than 5,800 - pound thrust, is powering our fastest fighters and bombers, such as the Stratojet (right), which can exceed 600 m.p.h.



and of our Air Force's jet aces, 29 years.

The explanation is not that supersonic jets are easier to fly. Instead, the explanation is that *no* human reflexes and reactions are fast enough to be relied on in a jet plane.

Electronic and automatic controls, which used to serve as a co-pilot occasionally, are literally the pilots in today's jet. The automatic pilot that once took over to relieve the human pilot in tedious, long, level flight now is left at the controls during loops, rolls and other combat maneuvers.

Electronic devices also aim and fire the guns, cannon and rockets.

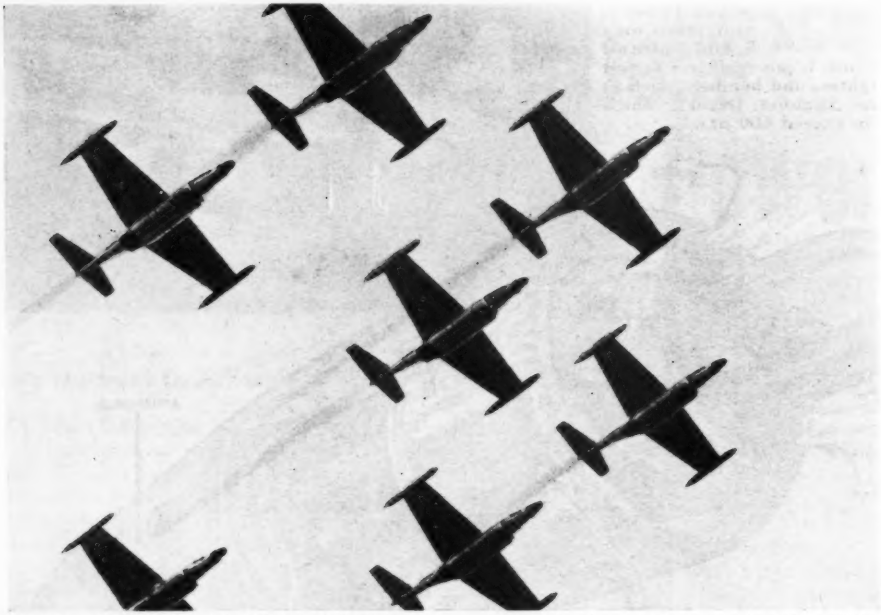
Yesterday the radarman was usually on the ground, scanning the skies for enemy

How a Jet Engine Works

Air is drawn into a compressor, where its pressure is raised. The compressed air is then forced into a combustion chamber. There fuel is sprayed in by high-pressure pumps, and ignited. Combustion greatly expands the air. The hot gases need more room, and as they rush out toward the tail exhaust they pass over a turbine wheel which is mounted on the same shaft as the compressor. Thus, the turbine turns the compressor, sucking in still more air to be burned and expanded.

But not all the air is needed for this job. The rest of the pressure energy spews out through the tailpipe at very high velocity, creating the jet reaction that speeds the plane forward.

Some jets have an extra tail unit, called an afterburner, where gases that otherwise would be wasted are reheated to increase the jet reaction—or thrust—giving more speed and power.



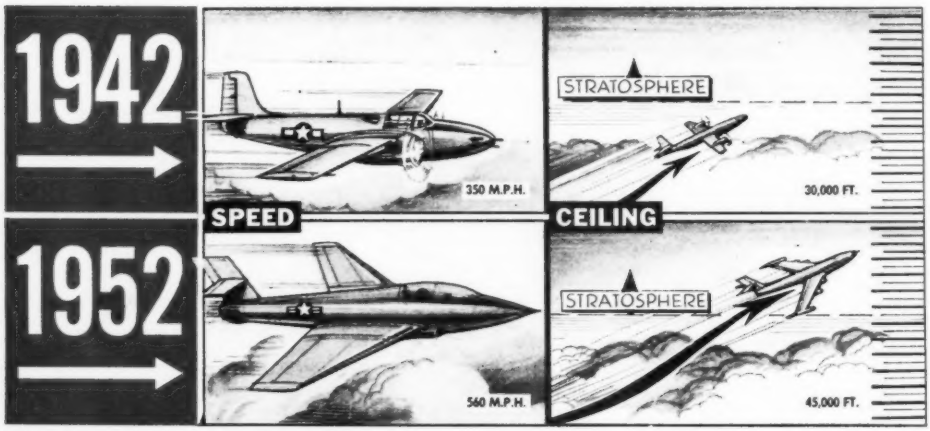
JET POWER symbolized by flight of F-89 Scorpion interceptors. To strike at enemy targets anywhere in the world, we are building eight-jet, 10,000-mile, atomic bombers.

attackers. Jet engines have made it necessary to put him in the cockpit.

Ten years ago we had pursuit planes to chase enemy skyraiders—usually after they had done their damage. Then came fighter planes that went up to do battle over the target. Now we have all-weather, radar-nosed, electronics-packed interceptors to shoot down attackers on their way to a target.

The great limitation of jet planes at first was their range. But now we can intercept an enemy long before he reaches us—if we are alerted in time—or deliver jet-borne

How Air Force Compares



bombs, bullets or rockets far behind an enemy's ramparts.

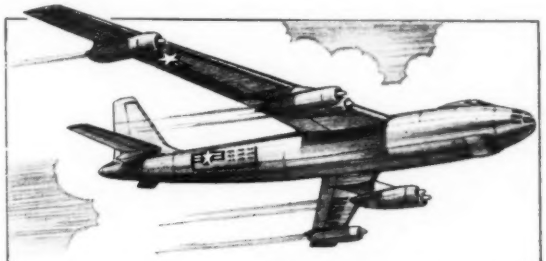
No distance is too great for fighters and interceptors now. That was proved last July when a squadron of Air Force F-84 Thunderjet fighters, refueling in mid-air over the Pacific, flew 2,400 miles non-stop from California to Honolulu.

When the late General "Hap" Arnold, World War II chief of the Army Air Forces, told his staff in 1945 to "throw everything you have learned about aviation out of the window," he was thinking of jet speeds, push-button warfare.

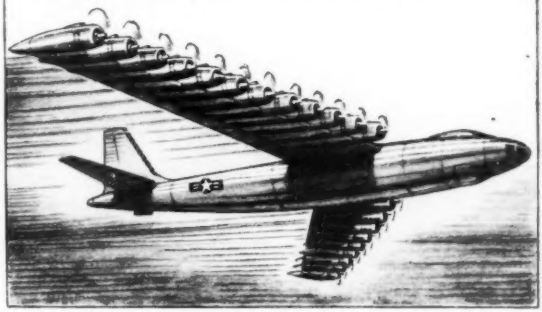
Jet engines have brought about changes in both the tactics and strategy of aerial forces, and fighting at supersonic speeds now is pretty close to push-button warfare.

Peering into the future, Maj. Gen. Donald L. Putt of the Air Force sees even more rapid developments in the next 10 years than in the last. "We foresee," he says, "jet engines that will develop thrust in the 20,000- to 30,000-pound range . . . By 1955 they should be operating at speeds of more than 1,000 miles an hour and at altitudes in excess of 50,000 feet." END

How Jet Thrust Compares with Horsepower



JET power is rated in pounds of thrust. Roughly, one pound of thrust is equal to one horsepower at a speed of 375 miles an hour. Thus, to equal the peak 54,000-pound thrust of the B-47 Stratojet (above) at 600 m.p.h., would require 24 piston engines of the World War II type (below).



After 10 Years of Jet

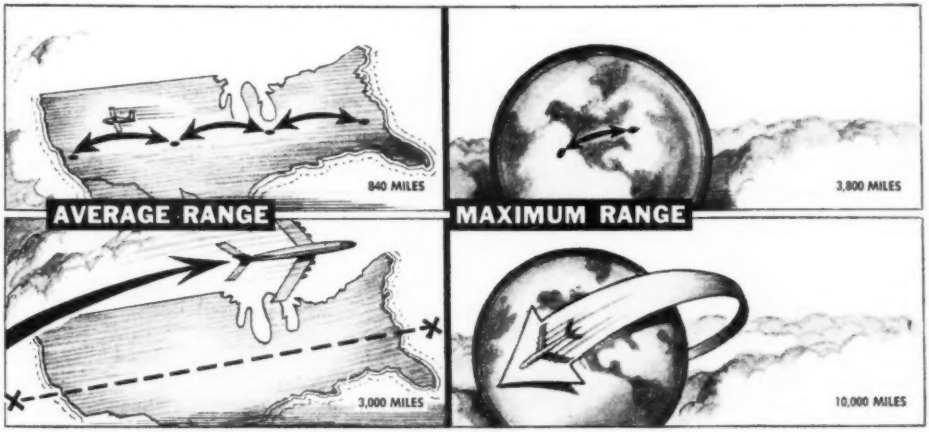
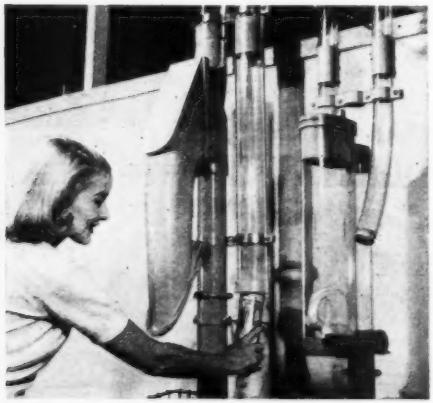


Table Brings Work to Riveter

THE worker riveting this aircraft wing panel need not move from his seat to do the job. Push buttons on the work table move a wing forward, backward and sideways so that the work area is always under the riveting machine. Designed by Lockheed and Temco aircraft corporations, the new setup saves hours on each panel, increases accuracy, reduces operator fatigue.



Plastic Pipes Carry Messages

OBSTRUCTIONS are quickly located in a pneumatic conveyor system (left) in which both pipe lines and carriers are made of tough, transparent Tenite. The new system is also said to be easier to install.

Tiny Device Spots Radiation

THIS pocket Atometer is filled with a liquid that changes color when exposed to atomic radiation. The degree of exposure is found by comparing the color with a chart. The Magnex Corp., Jamaica, N.Y., makes it.

Week-End Railroad Run Like Real One

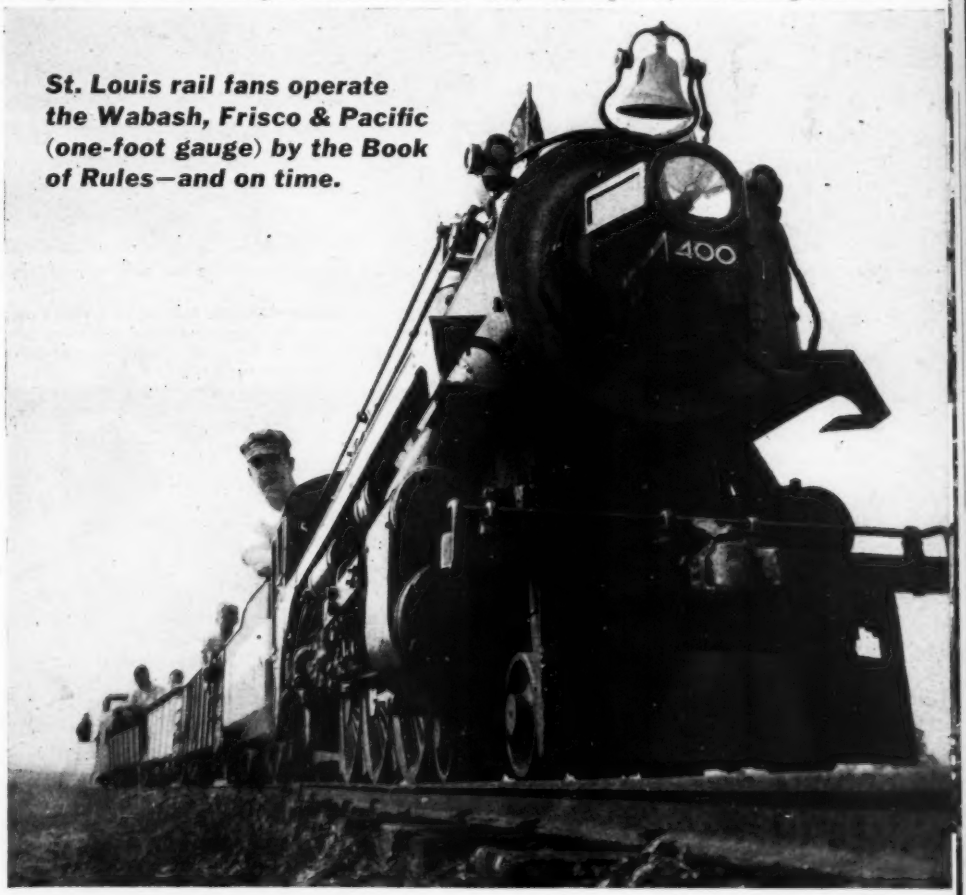
By Robert Lasch

DONALD MILLER of St. Louis has a simple formula for organizing a railroad. First, you find an old locomotive lying around in somebody's basement. The rest comes easy.

That's just what he did, 13 years ago. He got wind of a 12-inch gauge engine gathering dust in a neighbor's basement, and, with a couple of dozen friends, train cranks like himself, parlayed it into a full-fledged narrow-gauge railroad system.

The Wabash, Frisco & Pacific, they call it—after the three major railroads of St. Louis. The namesake lines, like others in

The pride of St. Louis' midget railroad is Number 400, a 5,000-pound, coal-burning Pacific.



St. Louis rail fans operate the Wabash, Frisco & Pacific (one-foot gauge) by the Book of Rules—and on time.

Brakeman's signals are full-scale; so are the marker lamps, switch stand and semaphore.

the nation, have suffered at least one interruption in service during the last 12 years. But the WF&P—whose officers, owners and workers all toil happily without pay—has never missed a Sunday since 1940.

Thirty-five businessmen, professional men, students and teachers now belong to the association which owns and operates the system on research chemist Carlisle Schade's 30-acre farm in St. Louis County. They have well over $20,000 sunk in three locomotives, 11 freight cars, a caboose, two passenger coaches, a mile of 12-inch gauge track, three stations, telephone and telegraph lines, shops, 22 switches, regulation signals, a turntable and a pint-size gasoline-driven section car.

The Wabash, Frisco & Pacific takes itself so seriously that trains run on a timetable, subject to written orders, in charge of crews who have passed examinations based on the standard code of operating rules for the Association of American Railroads.

On one memorable Sunday when the

EIGHT-WHEELED NUMBER 180 takes a short one for the road. In heavy passenger service she evaporates 23 gallons of water on a double circuit of the one-mile pike.

St. Louis area was glazed with a thick sheet of ice, the semi-pro railroaders had to attach a steam hose to the locomotive and melt the ice on the 12-pound rails out ahead. By the time they cleared a stretch of track, the locomotive would have to back up to the shops for coal and water, then tackle the grades anew. It took eight hours to make the run normally scheduled for a slow freight at 13 minutes—but they made it.

How You Assemble a Railroad

The original WF&P locomotive—Engine No. 171—had seen years of amusement-park service before retirement to its basement corner. It is a 4-4-0 type with tractive force of 225 pounds, 10¾-inch drivers, 2½ by 3½ cylinders, steam pressure 130 pounds, weight 1,400 pounds. The WF&P rebuilt it completely, added a tender, and right away started looking for another locomotive.

Engine No. 180, slightly larger, with 300 pounds of tractive force, was bought—in non-operating condition—from a nearby amusement-park operator for $450. It, too, was rebuilt.

But the railroad's collective emotions really churned when its officers located what was to become the prize of the line—a 4-6-2 locomotive, tractive force 770 pounds, weight 5,000 pounds.

This was a working scale model of the Canadian Pacific's 2300 class, three feet high and 15 feet long including tender. It had been built in England in 1925, and had seen service at England's Wembley Exposition in the Twenties. It emigrated to this country for the Philadelphia Sesquicentennial Exposition, and the WF&P found it at an amusement park in Denver.

The only hitch was finance. The engine had a price tag of $3,500 on it. The WF&P had been spending between $1,000 and $1,500 a year on the system but couldn't see that kind of money. But just when hopes were lowest a mysterious financier let it be known that a loan could be had on terms of strict anonymity. The deal was closed and the loan for No. 400 later paid off.

Rails Are Junkyard Salvage

Rails were picked up in nearby junkyards, which had taken them in as scrap from abandoned narrow-gauge mine tracks or amusement parks. Four-by-four ties 24 inches long were cut from oak timbers and creosoted free by a tie firm. Ties and rails

[*Continued on page 248*]

FREE TICKETS boom traffic, but Dad and Junior are no deadheads. They'll drop a contribution into a special box to help keep the $50,000 railroad running in the black.

LOCOMOTIVE HOSTLER knocks the fire. Good fuel and careful servicing pay off in top performance. Besides, a black exhaust is frowned on by the management.

DISPATCHER'S OFFICE is less formal than most, with brakemen receiving their orders directly from the "delayer." All movements are recorded on a standard train sheet.

How to Choose Your

A good tree lasts a lifetime. To help you pick the right ones, Popular Science has consulted experts all over the country.

TREES can do a lot to make your house more valuable—if you pick the right trees. But picking the right tree isn't as easy as it looks. There are more than 3,000 kinds in the United States—and they come in every shape, size, color and hardiness.

What's more, they come with all kinds of habits, good and bad, that you might not find out about until you've lived with them for a time. Some handsome trees have arboreal halitosis—they smell terrible. Others are untidy, dropping messy fruits or seed pods on the lawn. And some respectable trees have bad companions—bugs that raid your house, or blights for other trees.

Some Are Invalids

Some trees are likely to be chronic invalids, keeping you broke pouring asphalt cement into them. Trees that start out growing like Jack's beanstalk may get discouraged and die on your hands after a few years. There are trees that are roughnecks, out of place in the suburbs but useful in grimy cities where their gentler rivals would die. There are even thorny trees that are dangerous to pets and children.

To help you choose the best kind of trees to plant around your home, POPULAR SCIENCE MONTHLY has asked tree experts at argricultural experiment stations all over the country for advice. We also asked similar questions of leading members of the American Association of Nurserymen.

We made it a point to have the survey nationwide because the climate and soils of the different parts of the country vary so much that no single list of trees makes sense. With experts reporting from every section, more than 350 trees have been suggested. You'll find the most popular ones on the chart on the next two pages.

Maples Are Favorites

You'll notice that some names appear over and over again. Of course not even these trees can be used everywhere, but they are, in general, the trees that experts like best—foi you.

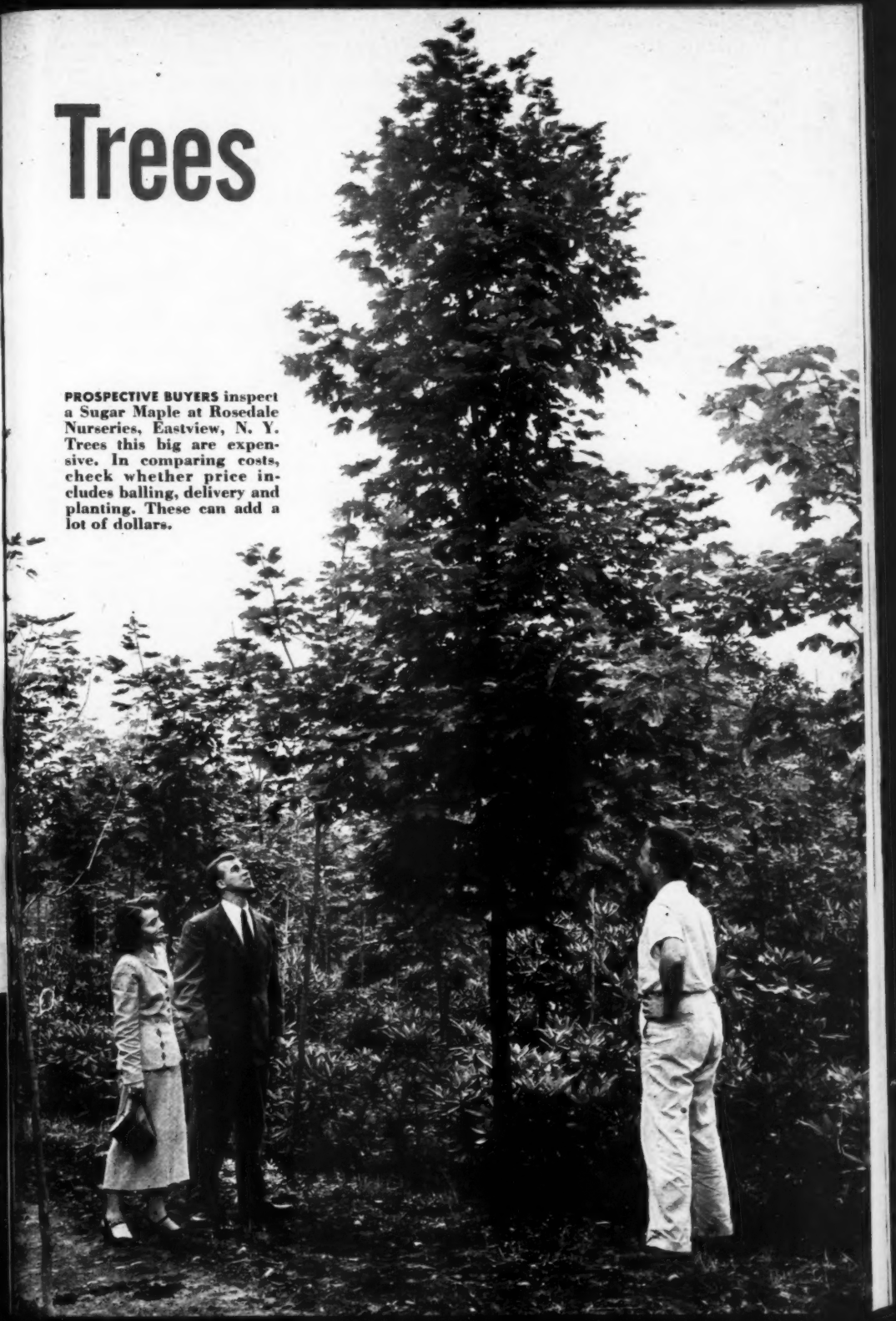
Among them, the Sugar Maple leads the field. Sugar Maple sap makes maple syrup, but the experts like the tree because it is handsome and fine for shade. Strong and easy to care for, it eventually grows to 90 feet—and sometimes as much as 110.

The Red and Norway Maples also drew

IN BUYING TREE, choose a reputable nursery that follows standards of American Association of Nurserymen. Shade tree should have at least minimum height for diameter. Sugar Maple should be five feet high for ½-inch tree, 18 feet for five-inch-diameter specimen.

SIZE OF BALL IS IMPORTANT. For nursery-grown Sugar Maple, ball should be at least 18 inches across for 1¼-inch-diameter tree; four feet for five-inch-diameter. Natural-grown trees need one-third larger balls. Small trees are usually sold bare-rooted.

Trees



PROSPECTIVE BUYERS inspect a Sugar Maple at Rosedale Nurseries, Eastview, N. Y. Trees this big are expensive. In comparing costs, check whether price includes balling, delivery and planting. These can add a lot of dollars.

Pick Your Trees by Where You Live

THE chart below combines suggestions by horticulture experts at state agricultural expe-

REGION	SHADE	WINDBREAK	PRIVACY
1 Pacific Northwest WASH., ORE.	Norway Maple, Pin Oak, Red Oak, White Birch, American Linden.	American Arborvitae, Lombardy Poplar, Siberian Pea Shrub.	Common Lilac, Japanese Quince, Willow, Siberian Pea Shrub, Japanese Snowball, Wayfaring Tree.
2 California CENTRAL VALLEY	Hackberry, Chin. Pistachio	Aleppo Pine, Olive	Modesto Ash
So. Calif. SEASHORE	Australian Tea Tree	Myoporum laetum	Myoporum laetum
So. Calif. NEAR COAST	Brazilian Pepper Tree	Catalina Cherry	Catalina Cherry
So. Calif. MOUNTAIN	California Sycamore	Incense Cedar	Incense Cedar
So. Calif. DESERT	Texas Umbrella Tree	Oleander, Tamarisk	Oleander, Tamarisk
So. Calif. INLAND VALLEY	Modesto Ash	Catalina Cherry	Catalina Cherry
3 Rocky Mountain States IDAHO, COLO., N. M., MONT., WYO., NEV., UTAH, ARIZ.	Green Ash, Thornless Honey Locust, Fruitless Red Mulberry, Norway Maple, Pin Oak, Bur Oak, Plane Tree.	Siberian Elm, Arizona Cypress, Green Ash, Ponderosa Pine, Eastern Red Cedar.	Flowering Crab Apple, Colorado Blue Spruce, Lombardy Poplar, Silverleaf Poplar.
4 Extreme Cold Area ME., VT., N. H., NO. N. Y., MICH., WIS., MINN., N. D., S. D.	Norway Maple, Sugar Maple, American Elm, Red Maple, Green Ash, Thornless Honey Locust.	Norway Spruce, White Pine, Norway Pine, White Cedar, Austrian Pine, Arborvitae, White Spruce.	Hemlock, Arborvitae, Willow, Upright Japanese Yew, Russian Olive, White Cedar, Black Hills Spruce.
5 Great Temperate Area CONN., MASS., N. J., SO N. Y. AND L. I., R. I., PA., DEL., MD., W. VA., VA., KY., TENN., IND., ILL., IOWA, MO., ARK., NEBR., KAN., OKLA., OHIO	Sugar Maple, Northern Red Oak, American Elm, Thornless Honey Locust, London Plane Tree, Red Maple, Tulip Tree, American Ash, Sweet Gum, European Linden, Norway Maple, Pin Oak.	Norway Spruce, Red Cedar, White Pine, Katsura, Austrian Pine, Norway or Red Pine, Hemlock, Douglas Fir, American Ash, Pin Oak, Upright Japanese Yew, Arborvitae.	Arborvitae, Canada Hemlock, Amur River Privet, Red Cedar, Chinese Juniper, Holly, Crimean Linden, Purple Beech, Katsura, Dolgo Crab, Ginkgo, Norway Spruce.
6 Southern Atlantic and Gulf States ALA., GA., LA., MISS., N. C., S. C., TEX.	White Oak, Water Oak, Live Oak, Willow Oak, Magnolia, Tulip Tree, Laurel Oak, Pecan, Winged Elm, Cedar Elm.	Carolina Laurelcherry, American Holly, Loblolly Pine, Southern Magnolia, Arizona Cypress, Photinia.	Red Cedar, Carolina Laurelcherry, Holly, Southern Magnolia, Photinia, Arizona Cypress, Glossy Privet.
7 Florida NORTH & CENTRAL	Laurel Oak, Water Oak	Laurelcherry, Oak	Laurelcherry, Wax Myrtle
SOUTHERN	Jacaranda, Fig Tree	Casuarina	Australian Pine, Camphor

many votes. The Red, often called Swamp Maple, has striking autumn foliage. The Norway, smaller than most maples, is better scaled for small houses. Both trees, however, are hard to grow grass under because of their dense shade and shallow roots.

The tree that draws most blackballs is also a maple—the Silver Maple, which gets its name from the silver gleam of the underside of the leaves when riffled by the wind. Although some experts and nurserymen like it for its handsome shape and size, and

riment stations all over the country with those of leading members of the American Association of Nurserymen. Trees most often suggested are listed first. Some trees rarely mentioned are omitted for lack of space. Among the factors considered in making these choices were availability, price and amount of care required. Remember suggestions are generalized for large areas. For data on your neighborhood write your own state agricultural experiment station and ask local nurserymen and neighbors for advice.

FRUIT AND NUTS	FLOWERS	LANDSCAPING	AVOID
Apple, Sweet Cherry.	Flowering Crab Apple, Flowering Plum, Dogwood.	European White Birch, Cutleaf Weeping Birch, Flowering Plum.	Chinese Elm.
English Walnut	Pomegranate, Kumquat	Chinese Hackberry	Lombardy Poplar
Apricot, Seckel Pear	Flame Eucalyptus	Aust. Tea Tree, Holly Oak	Native Oaks, Pepper Tree, Moreton Bay Fig, Canary Island Palm.
Anaheim Avocado	Sharpleaf Jacaranda	Podocarpus gracilior	
select under local advice	Mountain Ash	Lawson Cypress, Inc. Cedar	
Grapefruit	Golden Rain Tree	Modesto, Montebello Ash	
Lemon, Apple	Flow. Plum, Peach, Apple	Sweet Gum	
Dwarf Apple, Pear, Plum, Pecan, Apricot, Black Walnut.	Flowering Crab Apple, Bechtel's Crab, Flowering Peach, European Mountain Ash, Flowering Cherry, Flowering Plum.	Thornless Honey Locust, Norway Maple, Modesto Ash, Flowering Crab Apple, Green Ash, European Weeping Birch.	Chinese Elm, Silver Maple, Box Elder, Eastern Flowering Dogwood, Redbud, Arborvitae, Hemlock (Colo.), Poplar (Idaho), Tulip Tree.
Black Walnut, Apple, Hickory, Sour Cherry, Plum, Butternut.	Crab Apple, Thornless Honey Locust, Horse Chestnut, Black Locust, Hawthorne.	Norway Maple, European White Birch, Thornless Honey Locust, American Beech, Sugar Maple.	Chinese Elm, Silver Maple, Box Elder, Poplar, Tree of Heaven, Tulip Tree, Dogwood, Magnolia.
Apple, Pear, Black Walnut, Shellbark Hickory, Cherry, Peach, Crab Apple, Chinese Chestnut, Butternut.	Dogwood, Flowering Crab Apple, Redbud, Magnolia, Flowering Cherry, Hawthorne, European Mountain Ash, American Holly, Empress Tree (south of NYC), Dolgo Crab, European Beech.	Sugar Maple, Red Pine, American Elm, Pin Oak, Dogwood, Sweet Gum, Norway Spruce, White Pine, Red Oak, Flowering Crab Apple, Star Magnolia, Water Oak (south of NYC), Ginkgo, Linden.	Chinese Elm, Box Elder, Silver Maple, Poplar, Sycamore, Mulberry, Tree of Heaven, Catalpa, Gray Birch (Dogwood, Tulip Tree not hardy in Iowa).
Pecan, Common Fig, Persimmon, Cherry, Peach.	Flowering Dogwood, Eastern Redbud, Southern Magnolia, Crape Myrtle, Holly, Silktree Mimosa, Fire Thorn.	Sweet Gum, Southern Magnolia, Willow Oak, Winged Elm, Flowering Dogwood, Magnolia Grandiflora.	Lombardy Poplar, Siberian Elm, Black Cherry Chinaberry.
Orange, Pecan, Peach	Magnolia, Dogwood	Flowering Magnolia	*For South Atlantic mountain areas, use group 5 lists. For Georgia and Gulf Coastal areas, use Northern Florida lists.
Guava, Avocado, Mango	Golden Shower Tree	Magnolia, Braz. Pepper	

particularly because it grows rapidly, many horticulturists turn thumbs down. The wood of the Silver Maple is so weak and brittle that branches are likely to come crashing down in wind or ice storms. And it is apt to die comparatively young (young for a tree, that is—which may mean 75 years old.)

The oaks have even more members on the recommended list than the maples. The Northern Red Oak is an especial favorite—not only for its shade and beautiful fall color, but because it grows faster than

TREES FOR HOMEOWNER TO AVOID include ordinary Honey Locust, whose spikelike thorns endanger children and pets. Same tree has now been bred without thorns or seed pods that must be raked up. Thornless type is hardy, disease-resistant, considered a promising new shade tree. It rates high on the "recommended" list.

RATE OF GROWTH AND EVENTUAL SIZE of Sugar Maple are shown in drawing. Rate is typical of many good shade trees. Sugar Maple's eventual height suits two-story houses better than modern one-story ranch types. Keep eventual size in mind when picking a tree to avoid overgrown look later on.

other oaks. It reaches 70 to 90 feet—like the maples, big for today's average home.

Southern tree men urge the merits of the Live Oak—the massive giant found along the South Atlantic coast. Another favorite, particularly in the Middle West, is the Pin Oak. This makes a fine shade tree.

Beware of the Elm

The oaks would have gotten more votes except for the threat of oak wilt in the north central states. For similar reasons many horticulturists steered clear of the most famous American shade tree, the elm. The Dutch Elm disease—a fungus infection carried by a beetle—has been spreading ever since it was brought to this country in veneer logs a quarter century ago. In some areas elms are also threatened by a destructive virus called phloem necrosis. But some experts recommend this famous tree anyway as "still the best of its kind for those willing to protect it."

Among evergreens, the pines lead in popularity. The White Pine—the tree on the pine-tree flag flown by Yankee minutemen—is recommended for windbreaks. It's the second largest pine, growing 80 to 90 feet high, but you can keep down its size by shearing it. In good soil, it grows as much as a foot a year for the first 20 years. But look out for White Pine blister rust, carried by currant bushes.

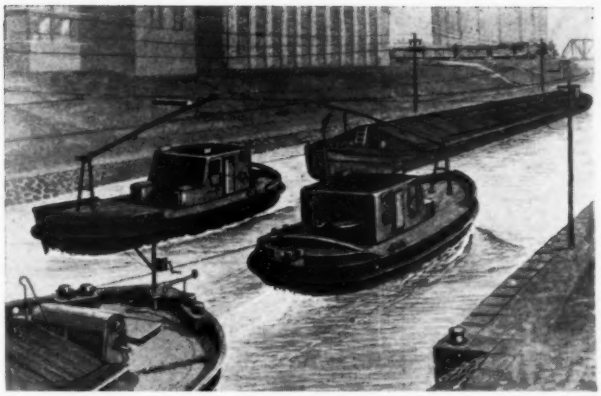
Evergreens Make Good Windbreaks

The Red or Norway Pine, often found with the White Pine in our native forests, is another tree urged for windbreaks. Evergreens get the nod for this job because winter foliage is needed to make a dense wall. The Norway Spruce and the so-called Red Cedar—really a juniper—that takes over abandoned New England meadows are also recommended. Although rather slow-growing, the Red Cedar with its fragrant wood and bark is suggested for privacy screens. But keep it away from apple orchards; it carries the cedar-apple rust.

And the apple is pretty important in the eye of the experts. Not only is it way ahead among suggested fruit trees, but it is a good tree for kids to climb. One expert urges getting little apple trees and grafting on several varieties yourself. He also suggests one- or two-year-olds, rather than the more expensive ones of bearing age. Many horticulturists, though, are cool toward the

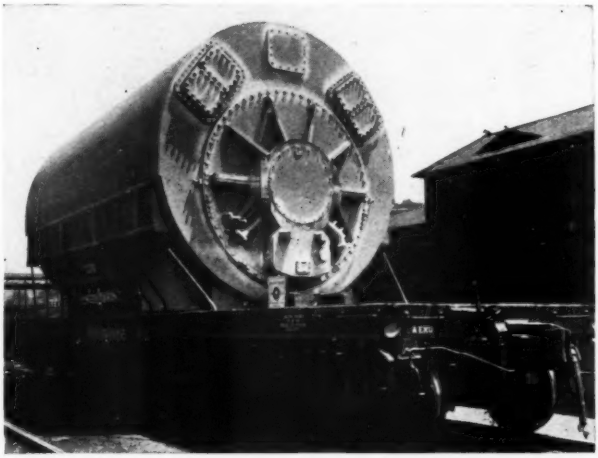
[*Continued on page 250*]

Trolleys Power German Tugboats



ELECTRIC tugboats powered through trolley poles riding overhead wires are being tested on a German canal between Zehdenick and Berlin. Batteries, charged by the trolleys, take the tugs through locks and any other spots where the trolleys can't be used. The builders hope to install the system on the Mittellandkanal which crosses all of Germany.

Giant Generators Ride the Rails on Heavy-Duty Flatcar



AN ATLAS of the rails, the 106,000-pound flatcar shown at left can shoulder more than four times its own weight. Sixteen wheels on four trucks beneath the flatcar bed won't buckle under a load of 493,000 pounds—more than 246 tons.

The car is used for shipping huge stators and generators and carries all but the very largest generators completely assembled for use. It was built for Westinghouse by the Thrall Manufacturing Co. of Chicago Heights, Ill.

All-Purpose Garden Clipper Runs on Compressed Air

THIS English clipper is driven, cleaned and lubricated by compressed air. It is said to mow a 15-inch swath, trim 2,000 square feet of hedge in an hour and cut one-inch tree limbs. A notch at the tip lops off branches. The entire tool, with its 10½-ounce motor, weighs less than three pounds. R. M. Marples and Son, Parkstone, Dorset, make the clipper, called a Shearomatic.

They're sleek, slick, dependable, with twice the horses under the chrome that the old-timers had.

By E. F. Lindsley

Then Old-time cyclists had to be a rugged, wrench-wise lot. Above, sports-writer Hamilton M. Laing rode this 1914 Harley, with acetylene light and exposed valve rods.

Look What They've Done to Motorcycles

MY FIRST motorcycle, a roaring, smelly, kidney-kicking mechanical bronc, was a 1921 Harley-Davidson. Don't guess my age from that. The bike was older than I was. But it taught me, as such seventh-hand motorbikes taught thousands of American boys, what made gas engines go.

Sporting a 61-cubic-inch motor with naked push rods and rocker arms, this job was once advertised to have "all the speed

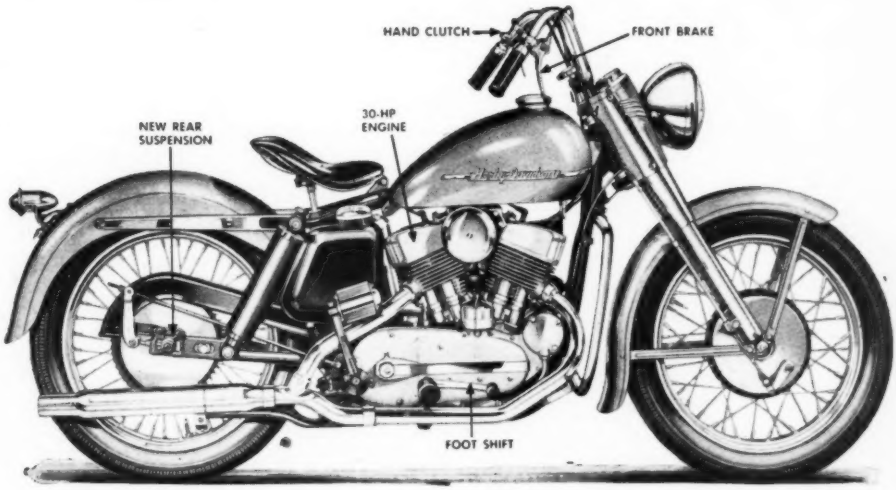
EDITOR'S NOTE:

Back in 1901 two Milwaukee schoolboys dreamed of putting an engine on a bicycle. With the help of Walter Davidson, a railroad machinist, Bill Harley and Arthur Davidson cast and machined the parts for a three-horsepower engine. Their motorized bike ran, others wanted machines like it and the boys soon found themselves in business.

From that start in a 10- by 15-foot shed workshop, the Harley-Davidson Motor Co. has expanded to three modern factory buildings and built more than 682,000 motorcycles to date.

To learn how a former rider would react to the newest machines, we asked E. F. Lindsley, who hadn't ridden a motorcycle in years, to try the new Harley-Davidson Model K. Here's what he found.

Now This sleek Model K Harley-Davidson, a 45-cubic-inch twin, has twice the power of old machine at left, plus a four-speed, foot-shifting transmission, hand-operated clutch, swinging-arm rear suspension, hydraulic shocks and complete battery-generator electric system. You don't have to be a bronco buster-mechanic to ride nowadays.



anyone could desire." So it had; your yen for scat was tempered by the spine-jolting ride it delivered. What finish was left on it had once been (the catalogue said) an attractive olive drab.

Without getting out of my four-door sedan, I could tell that today's motorcycles are chrome-and-color beauties. But I had to get one between my knees to find that the real difference just starts there.

The one I tried out was the new Model K Harley-Davidson. This 45-cubic-inch twin is not only miles ahead of that ancient 21-J but far out in front of earlier postwar models.

The factory rolled out a machine for me and I eased into the saddle. They've done marvelous things to that upholstery you steer with (as any rider knows, it's done by the seat of the pants). Foam rubber, two sprung seat posts, and anatomy-wise contouring do the trick.

Where's the Shift?

Looking for something familiar to show I was no beginner, I latched onto a lever grip on each handle bar. "Front and rear brakes, eh?" I said.

Sammy Greco, the Harley man who was checking me out, chuckled at that. "Left one is the clutch. It gives you a faster shift than the old foot type."

My left foot groped speculatively where the clutch used to be. Then it settled down on a comfortable footrest just above a husky pedal. This was the rear brake. The right-hand grip was the front brake.

Facts on Model K 45 Twin

Engine: two-cylinder, air-cooled, four-cycle V type; piston displacement, 45 cu. in.; compression ratio, 6.5 to 1; bore 2¾", stroke 3 13/16"; 30 hp. at 5,200 r.p.m.; torque 32 lb. ft. at 4,000 r.p.m.

Weight: 446 lb. (no load); per hp., 14.9 lb.

Transmission: four-speed constant-mesh; sliding-dog clutches.

Gear ratio: 4.77 to 1 (in high gear).

Clutch: multiple dry-disk type.

Drive: motor to transmission, ⅜"-pitch triple chain; transmission to rear wheel, ⅜"-pitch single-row chain.

Rear suspension: swing arms pivoted on preloaded Timken bearings.

Front fork: load transmitted by long helical springs, hydraulically damped.

Top speed: 85 m.p.h.

Tire size: 3.25 by 19.

"What am I supposed to shift with, my teeth?"

Patiently they told me. "Biggest change in years. You shift with your right toe." I looked down and found a pedal I hadn't shoved yet.

"Hook your toe under the pedal and pull up." I flipped my toe and felt the constant-mesh gears do their stuff smoothly.

"You've got four speeds," Greco explained. "The lower gears give better acceleration. Top gear is a honey—a sort of overdrive for cruising."

30 Horses Have Zip

I knew the model K nudged the scales at nearly 450 pounds, so Greco's last words raised my eyebrows. "An overdrive ratio with a 45-cubic-inch engine?"

"Try it," said Chris Spexarth, Harley's assistant chief engineer. "I think you'll find 30 horsepower plenty hot."

"You mean 30 horses stripped down, without accessories, on the test stand?"

"No, sir," he snapped. "We mean 30 horsepower with full accessories, at a 6.5-to-1 compression ratio, on regular gas."

Later I saw the test curves. Horsepower peaked at 30 at 5,200 r.p.m. My old 21-J hit 16 hp. at a screaming 3,250 r.p.m. and fell off after that.

Closing the choke a bit, I retarded the spark (left handle-bar grip), opened the throttle slightly (right handle bar) and turned on the ignition. Then I booted the kick starter, and the engine boomed into a smooth rumble on the first try.

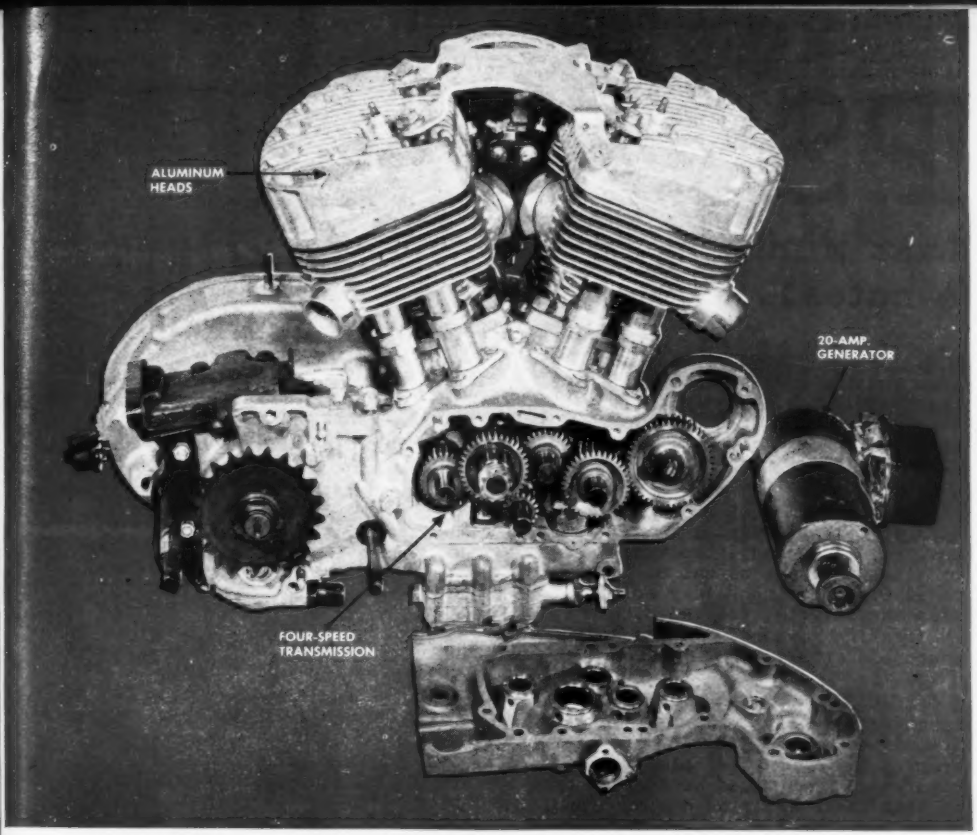
Left hand on clutch, flip into low with right foot, and let in the clutch. Smoothly the K took off. Grip the clutch, flip up right toe into the next gear, and ease in the clutch. The foot shift was fine.

Takes Bumps with No Bounce

I was musing on the nice handling and extra zip in third gear when I found myself almost on a big hummock, where concrete had buckled from the heat. There was no chance to swerve. Instinctively I rose off the seat to soften the jolt.

It came as a ripple. No jolt, no slamming wallop from the rear wheels. This was new, too—automobile comfort with motorcycling zest.

With traffic thin, the four-lane highway west of Milwaukee invited speed. Acceleration was excellent as I opened up, but top speed seemed a bit low and the engine was



NEW ENGINE develops 30 hp. Open crankcase above shows integral constant-mesh four-speed transmission. Cylinder walls are oiled by .040-inch jet. Generator gives 20 amps.

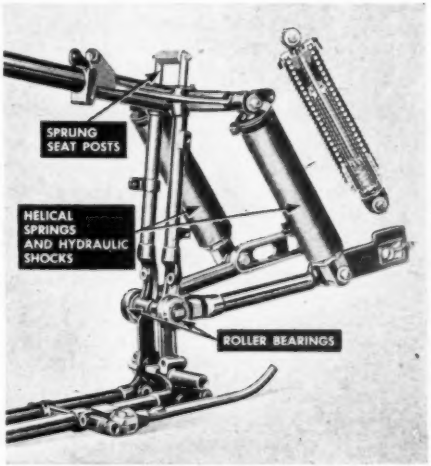
winding up hard. Then I remembered that fourth gear.

The shift was a revelation. Opening up, I hit top speed (85 m.p.h.) easily, then settled back to the 65-mile speed limit.

A short stretch of gravel roughened by storms again demonstrated the effectiveness of the new rear suspension. Two swinging arms, pivoted on roller bearings, have a full five inches of travel, with coil springs and hydraulic shocks to soak up the bumps. I found no sloppiness or fishtailing.

Back at the plant, chief engineer Bill Harley showed me through the modern testing department that puts machines and accessories through their paces before the riders do. His point—and he convinced me—was that you don't have to be a mechanic to ride a motorcycle these days.

Looking the new machines over, I still find a soft spot for the old 21-J. It was one of a long line of honorable ancestors, and it has some kids it can be proud of. END



REAR SUSPENSION, a rigid fork on old machines and a sliding mount with 1½-inch travel on later models, now consists of two roller-bearing pivoted arms.

P.S.

Last minute news & notes...

U.S. AIRCRAFT CARRIERS will make oxygen for their high-flying pilots. Special plants for extracting liquid oxygen from the air are being installed on vessels of the Midway, Essex and Forrestal classes.

PERMANENT MAGNETS of a new kind, among the most powerful ever made, have been produced without using any critically scarce nickel or cobalt. Naval Ordnance Laboratory scientists make the material, called Bismanol, by treating powdered bismuth and manganese at high temperatures.

A SELF-LIGHTING CIGARETTE, talked about for years, may at last reach the market. A company in California plans a million-dollar plant to make cigarettes that would be lighted by rubbing their emulsion-coated tips along the side of the package.

URANIUM will be produced as a by-product by six of South Africa's famous gold mines beginning this fall. Treatment of waste "slime" from gold production will yield uranium oxide, atomic raw material.

ANTIBIOTICS are usually thought of as lifesaving medicines--but last year $17,500,000 worth went into hog and poultry feed, too. For reasons still not completely understood, the germ killers make livestock grow faster and fatter.

SUBMARINES of France's new Narval class, advance tips say, will be faster underwater than afloat--and are expected to be able to dive far below the traditional depth limit of about 250 feet.

MOLTEN SULFUR will be the unusual cargo of a newly launched barge, which will carry it from a mine near Liberty, Tex.,to Houston for making sulfuric acid. Shipping the sulfur in the molten state will save later reheating. The barge's 167-foot insulated tank will keep 1,000 tons of the chemical at 300°.

GERM WARFARE is being waged against that scourge of Australian farmers--the rabbit. A virus called myxomatosis, intentionally spread in test areas, killed tens of millions of the pests in 15 months. The disease does not affect other animals.

WANTED: "Middle-aged" water--at least five years old, no more than 20--by Prof. W. F. Libby, University of Chicago, who seeks at least 30 gallons to test its content of radioactive tritium. He obtained some, but not enough, from an undertaker's fire extinguisher and a housewife's water jug. He hopes to find larger amounts in old hot-water heating systems, the kind that keep circulating the same water over and over again.

BRIGHT SCARLET LIFE RAFTS are likely to become the latest U.S. Navy style. Tests show that they can be spotted more easily by rescuers than the present chrome-yellow ones.

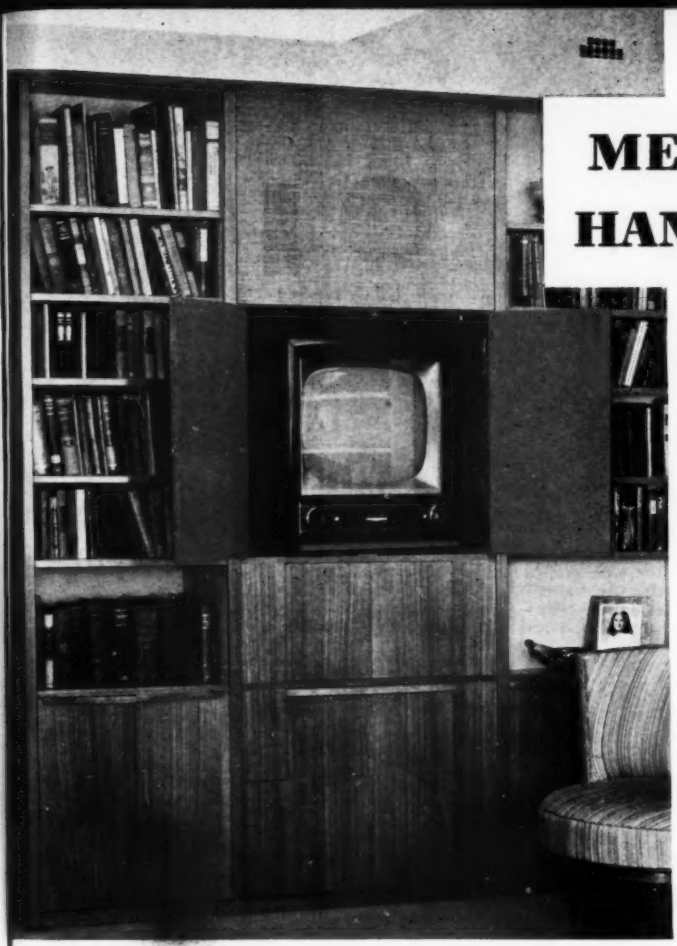
HOME RADIO SETS now can be mass-produced mechanically from start to finish. Formerly electrical connections had to be hand-soldered. Now even this has been eliminated, Motorola Inc. announces, by its adoption of completely "plated" circuits.

LIQUID METAL, which acts as a heat-transfer medium in modern atomic-reactor designs, may serve the same purpose in future steam power plants, too. Molten sodium, a metal of low melting point, carries heat for superheating steam in a power-plant design proposed by two engineers of the Knolls Atomic Power Laboratory, R. H. Shannon and J. D. Selby.

THE NATION'S FIRST high-power, ultra-high-frequency TV station, now under construction by GE, will be delivered for erection at Reading, Pa., this December. The 261-kilowatt station, WHUM-TV, will cover most of eastern Pennsylvania and parts of Delaware, New Jersey and Maryland.

The Editors

MECHANICS
and
HANDICRAFT
REG. U. S. PAT. OFF.



5 Ways to House Your TV Set

BUILT INTO WALL, TV set takes up no space in room, is hidden when not in use. Wall also houses radio, phonograph and speaker, stores records and books.

More people spend more time looking at your television set than at any other piece of furniture. You can improve its looks.

By Robert Gorman and Joseph Aronson

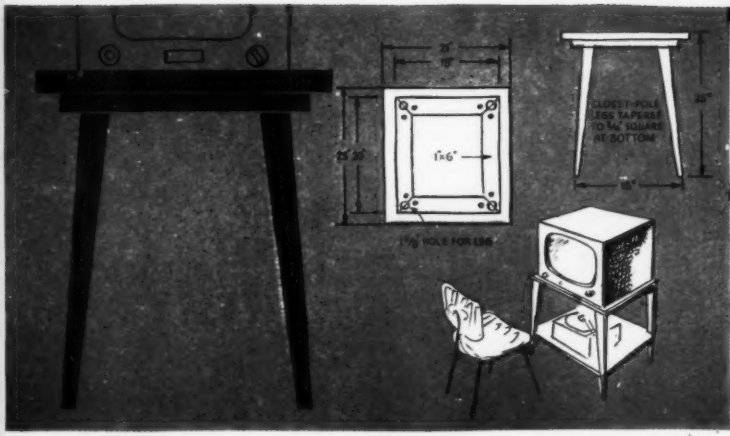
YOU parked that shiny new 20-incher in a place where it's in your way. Now you're wandering around the living room trying to find a suitable place to put it.

Or maybe you haven't bought one yet, and you're trying to decide what type to get. A console would look nice but cost a lot. Maybe you already have the radio-phonograph part anyway.

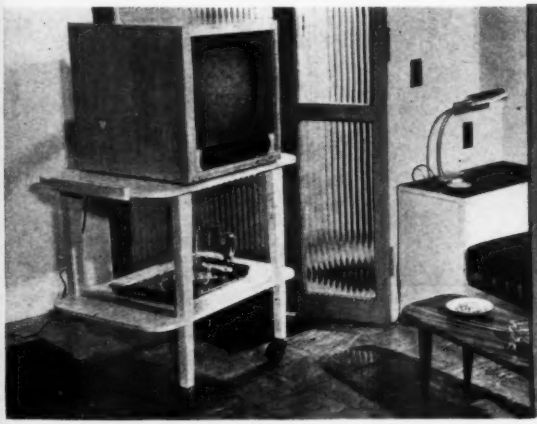
A table model would be ideal—but where to put it? It has to go where it can be seen by a number of people, and it ought to be 25″ to 30″ from the floor for proper viewing. That usually means putting it on top of something you already have. It would be bulky, it probably wouldn't match anything in the room, and it would steal valuable table space.

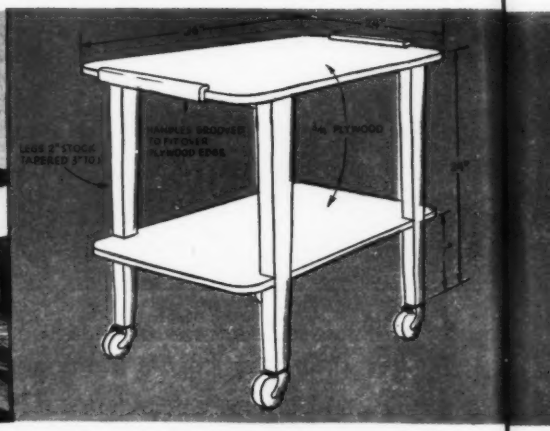
Actually, table sets are not only considerably cheaper than consoles, but they are vastly more flexible. The average modern set is roughly a cube measuring 20″ each way. That means you can squeeze it into some mighty small spaces. With a little ingenuity and work, you can put it on its own harmonizing table, fit it into a bookshelf, hide it in a wall, even cart it from room to room on a wheeled tea table.

1. Tables. A small table built to match or complement the receiver will make it look at home against a wall, in a corner or



1 TABLES. Take your pick of the simple one above or the more versatile one on the facing page. Top for table above can be ¾" plywood, or pine boards edge-glued together. Mitered frame, glued and screwed to underside, strengthens top and provides holes for closet-pole legs. Table is designed for 20" set; for smaller models, lengthen legs to raise set to proper height. Alternate version (above center) adds shelf.





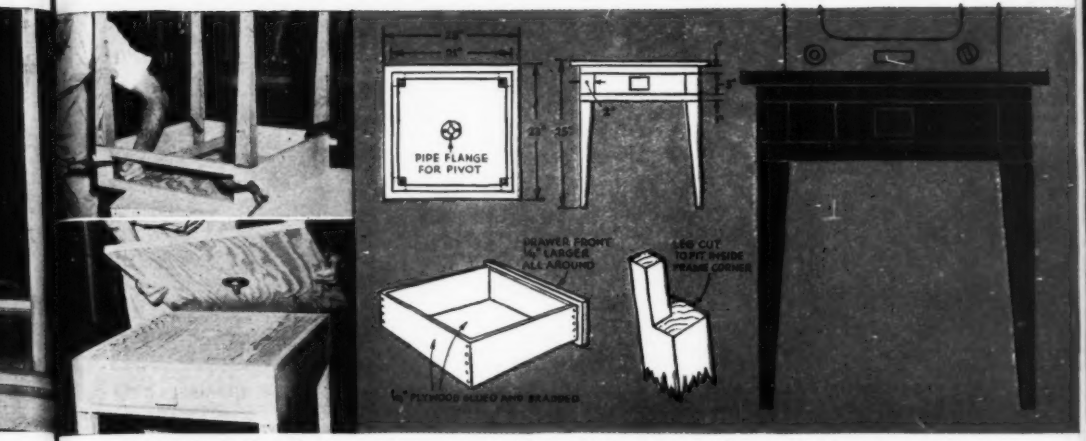
2 PORTABLE TV. A wheeled cart will roll out your set when you want it, then store it neatly out of the way when you don't. This one is made of birch plywood with solid-birch legs to match birch TV cabinet. For a painted cart, use less expensive fir plywood. Legs are glued and screwed to two cross pieces to which top is then glued and screwed. Shelf, notched to take legs, is doweled and glued in. Casters are 3" in diameter.

even in the middle of the floor to divide off two parts of a large room. The photos and sketches on this and the next page show basic tables that can be built to meet a variety of needs.

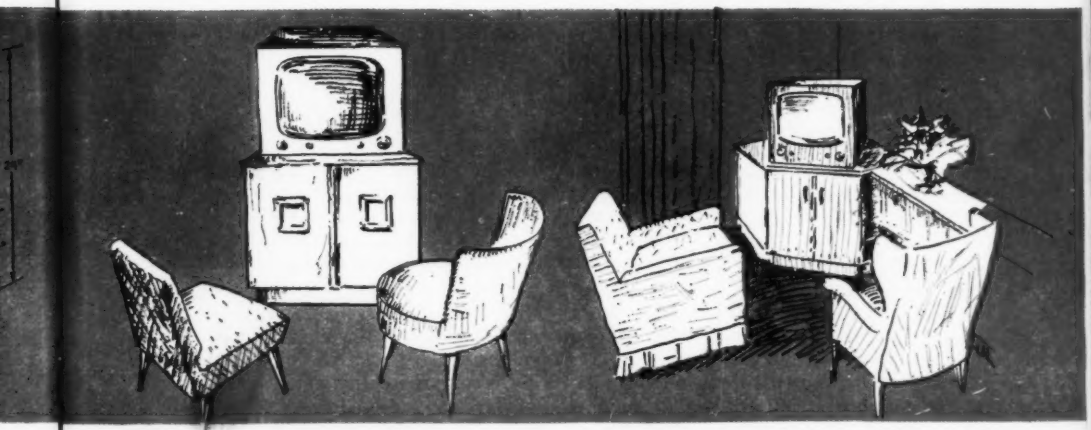
The first is little more than four legs and a top. The second adds a small drawer to keep TV schedules handy and has a swivel base so that the set can be viewed from any part of the room. On either one, make the top 2" larger than the set, including any picture-tube overhang in back of the set.

2. Portable TV. If you don't want to give up wall space for your set, you still have lots of choices. A wheeled cart will serve up television as easily as tea—and give you both wherever you want them.

It is an ideal answer to the very common complaint that the best place to *keep* a set is not the best place to *view* it. Maybe you have an alcove in a hall that's going to waste. The tea wagon will fill the space



TURNTABLE BASE and storage drawer make this table do several jobs. Top is ¾" plywood glued and screwed to ¾"-pine side frame. Notched legs are glued into frame, using C clamps and V blocks to hold them securely during drying (upper left). Rotating base pivots on short length of pipe screwed into pipe flange and inserted in hole in table top. Table shown here and one on facing page were designed by John Rogers of Dallas.



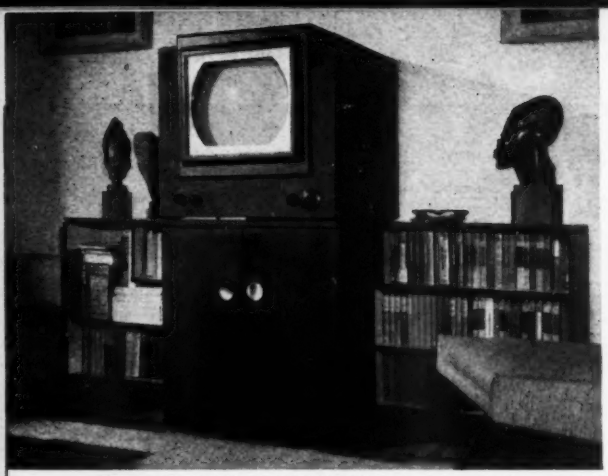
3 CONSOLE BASE, essentially just a box made of ¾" plywood, is easy to build, provides a lot of storage space below set. For best appearance, miter corners to conceal plywood edges. Toe recess should be about 2" deep, 2½" high—higher in back if you want cabinet to clear baseboard and sit flush against wall. At right is similar cabinet designed to fit in a corner. Bases should be 25" to 30" high, depending upon size of set.

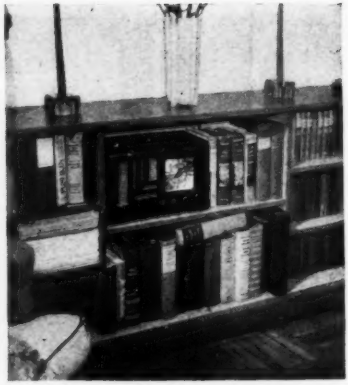
attractively during nonviewing hours, and when you want to watch a program all you have to do is wheel it into the room.

You can angle it toward your favorite chair and shift it around as others join the audience. You can roll it into the dining room so that you can watch it while you're eating, take it outdoors with you on hot summer evenings, and if you have a one-floor house, even move it into the kids' room so that they can have it when company comes and you don't want to be disturbed.

If you use an outdoor antenna on your portable receiver, tap the lead-in at several points and install twin-lead connectors so that you can plug in the antenna when you plug in the set.

3. Console base. Made of ¾" plywood, this is actually a simpler construction job than the tables. It blends well with the more massive modern furniture and has the advantage of making use of the space below





4 EXPANDING A BOOKSHELF is easy way to fit TV set into existing room arrangements without stealing much space. Here center section of old bookcase (right) was built out with plywood at the original height to take the set. Shelves and doors were then added to house radio and phonograph inside. Bookshelves blend well with set, add horizontal lines to reduce massive appearance. For another version, see below.

the set. You can house a radio and phonograph in the lower portion or just use it for extra storage.

If your furniture layout leaves no room along a straight wall, either a table or console base can be adapted for use in a corner.

A screen slanted across a corner usually faces the longest dimension of the room so that it can be seen by the most people in the greatest comfort. Angling any piece of furniture, however, is likely to make it somewhat conspicuous. Where possible, a corner table or console base should continue the lines of other furniture in the room. The sketch on the preceding page shows how a console base is tied in with a bookcase so that both seem to form a single unit.

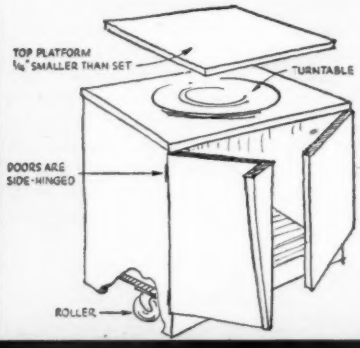
A triangular cabinet wide enough to take the full depth of most sets would measure about 60″ on each side. An installation as big as this would overpower most average-size rooms, beside wasting wall space. Lopping off the points of the triangle at the sides, as shown in the sketch, not only cuts much of the bulk but also provides flat sides against which you can place bookshelves, storage cabinets or other furniture.

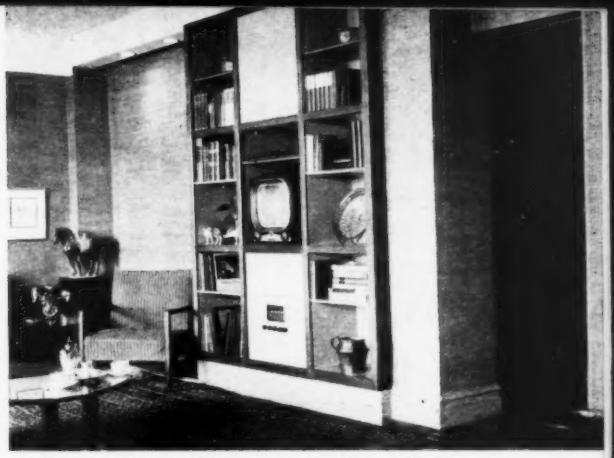
4. Expanding a bookshelf. If you have bookshelves along a wall, you can borrow a little of their space without altering the original plan—and without banishing your books to the cellar.

The low bookcase shown was originally divided into three sections by vertical partitions. The center section, just the right width for the TV set, was built out to double depth with plywood panels glued and screwed to the existing uprights, forming a support for the set.

The full, floor-to-ceiling bookcase gave up parts of four shelves to create a shallow

PULL-OUT CABINET fits in shallow alcove made by removing four shelves from center of tall bookcase. Cabinet, made of ¾″ plywood with space inside for radio and phonograph, has non-castering wheels that let it roll straight in and out without turning. Wheel mounts are screwed to underside of raised bottom, and sides are carried down almost to floor to hide them. Turntable on top permits set to be angled when cabinet is extended.





5 STORAGE WALL, built to fill part of wide, unused archway, houses complete home entertainment center, also serves as room partition. Since wall bears no load, construction can be simple bookcase type. Shelves holding heavy radio and TV units should be dadoed into uprights or supported on husky cleats, but others can just be nailed in or held by adjustable peg-type shelf hooks. Door at rear (left) gives access to units.

alcove for a wheeled table that rolls easily out for viewing, then back in for storage.

5. Storage wall. If you feel that your TV screen stares out at you like the single eye of a Cyclops, you may want to hide that eye when you're not looking at it. Building a simple bookcase-type storage wall to house the set will not only get it out of the room but will add valuable space for a radio and phonograph, record albums, books and other articles. Adding doors to the sections holding the electronic units will permit them to be hidden when not in use.

One trick for building in a full-height bookcase or storage wall is to make it slightly short of the ceiling, so that it can be moved easily into place, then wedge in blocks to fill the gap. Snugged in this way, the wall need not be attached to the floor or ceiling and can be taken down anytime without leaving permanent marks. Strips of molding nailed around the upper edges will conceal the gap. END

Model trains get the highball next month. See the tips on how you can dress them up and improve their operation.

ELECTRIC FOOD MIXER

If it does not run, the circuit is open. First check the wall outlet itself to make sure the house circuit is not at fault. The open could be in the cord or plug, in the speed-governor switch, or in the motor itself. A broken lead or loose connections could cause the trouble. In the motor, the field or armature could be open or the brushes stuck or worn.

If it does not run but hums, the beater gears may be jammed. Dry or worn bearings may freeze the shafts so the beaters cannot turn. If gears or gear pins break, the motor may run but not turn beaters.

If it is noisy, it may just need lubrication. Worn bearings or gears will also cause noise. If the speed governor is off balance, it will vibrate.

If it jerks and vibrates on a low-speed setting, the speed governor may be defective. The governor condenser or the resistor may be open.

If it has no power, it may require lubrication. Worn bearings or gears may produce enough friction to use up most of the motor power. Dirty governor contacts or a dirty motor armature commutator will prevent sufficient current from flowing.

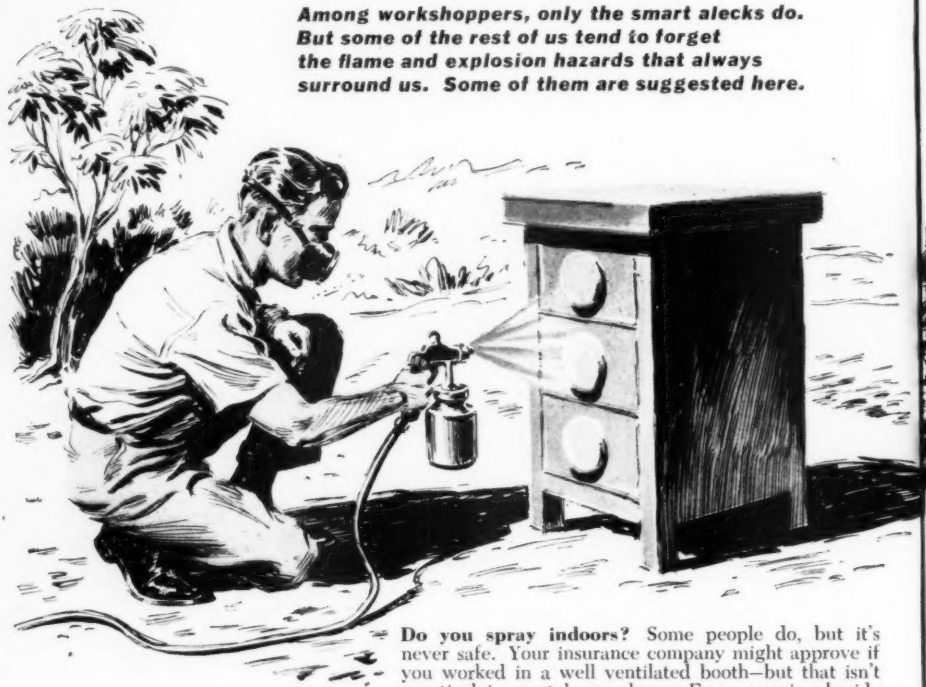
If it runs at high speed only, the chances are the governor contacts are welded, the governor condenser is shorted, or the governor is not operating.

If it will not shut off, the switch is defective or the linkage to the switch is out of adjustment. (From *Electrical Appliance Servicing*, by William H. Crouse.)

FOR YOUR *POPULAR SCIENCE MONTHLY* INFORMATION FILE

Do You Play with Fire?

Among workshoppers, only the smart alecks do. But some of the rest of us tend to forget the flame and explosion hazards that always surround us. Some of them are suggested here.



Do you spray indoors? Some people do, but it's never safe. Your insurance company might approve if you worked in a well ventilated booth—but that isn't practical in most home shops. Even spraying beside an open window doesn't put you in the clear, for the explosive atmosphere created by the paint could be set off by an electric spark, perhaps by a motor on the opposite side of the shop. Only safe way is to work outdoors, preferably with a mask to prevent poisoning or asphyxiation.

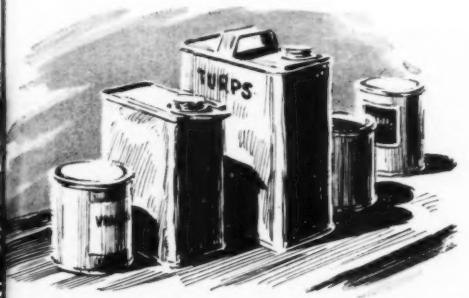
Do you stuff oily rags in a drawer? Putting a cloth soaked in linseed oil inside a closed compartment is a sure invitation to spontaneous combustion. Keep a closed metal container in your shop, perhaps a small garbage can, for disposal of all oily rags. Some workshoppers store machine-wiping rags in a coffee can.

Do you weld near combustibles? The flying sparks can cause sawdust and chips to smolder, perhaps to burst into flame hours later.

Do you leave litter on floor? Waste and wood chips left underfoot, to be swept up some day when you have more time, may bring a day when you'll have no shop—or home.

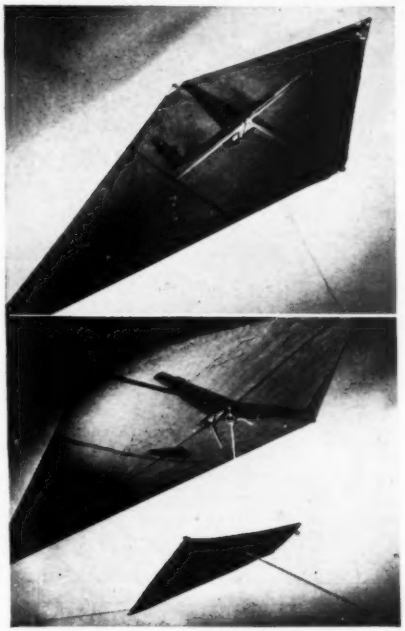
Do you smoke while spraying paint? One gent we know once turned the spray upon a burning cigarette to see what would happen. Nothing did—but his luck won't continue.

Is your wiring makeshift? Shop wiring should be heavy duty, at least equal to what comes with your motors. Stick to prescribed fusing. Never over-fuse to handle starting loads.



Are your solvents left uncovered? All paint thinners are volatile and an explosion hazard. Keep them tightly capped and store them in a spot away from extreme heat. This applies also to blowtorches. Gasoline should go outside.

Kite Launches Glider in Flight



JETO-KITE, the invention of a Canadian woman, adds a new note to the old sport of kite flying.

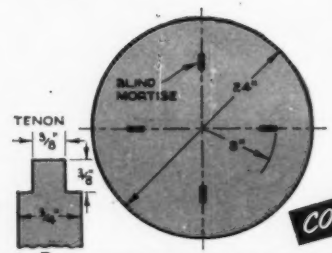
The kite is launched with a sleek balsa glider cocked on its back under rubber-band tension (top). When the kite is flown out to maximum altitude, a small release kite is sent up along the string Ben Franklin style. This kite climbs the string with sufficient momentum to trip the trigger on the carrier kite, sending the glider off into a steep loop followed by a long glide back to earth.

Mrs. G. D. McKay of Montreal has applied for a patent on the kite and plans soon to put it on the market.

Caster Positions Calking Gun

THIS simple attachment is a rolling rest that always keeps a calking gun at the correct angle. Shape a wooden block to fit the gun barrel and drill it to take the shank of a caster. Fasten the block to the gun with some wire. — *Ken Murray, Colon, Mich.*

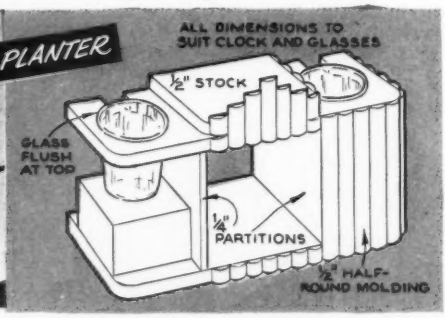
One Evening Shop Projects



COFFEE TABLE

For the living room. Simple lines make a low table that harmonizes with almost any type of furniture. I built this one of walnut, but other woods such as birch, maple or pine would be equally satisfactory. For the top, edge-glue ¾″ stock to make a piece a little more than 24″ square. Then bandsaw a 24″ disk. Blind mortises for the leg tenons can be made by drilling ⅜″ holes and then chiseling away the rest. Glue the tenons in and strengthen the legs with angle brackets. Finish the table to match the other furniture in the room.—*M. S. Schroeder, Mundelein, Ill.*

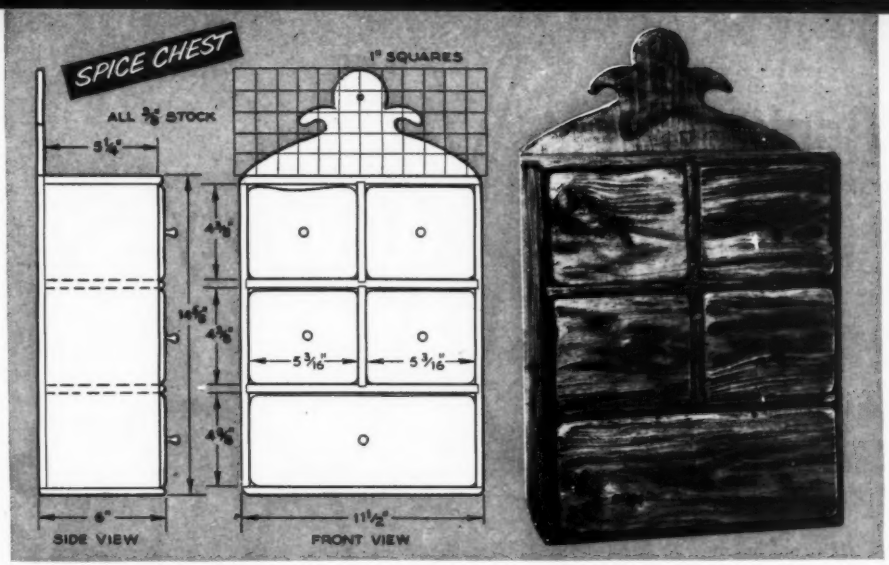
CLOCK PLANTER



For the dining room. A plain kitchen clock becomes an attractive wall decoration when it is housed in a plant holder like this. Most of the dimensions must be laid out to suit the clock you use.

Begin by cutting the upper and lower shelves. Join them with partitions of ¼″ stock to form the box that holds the clock. Then add the smaller shelf on top of the upper shelf. Brad and glue blocks to the lower shelf to support the glasses or pots that hold the plants.

Face the assembly with ½″ half-round molding, nailed in place, and screw two angle brackets under the top shelf to hold the unit to the wall. The planter can be painted or enameled to match the trim in the room.—*John G. Voelker, Baltimore.*

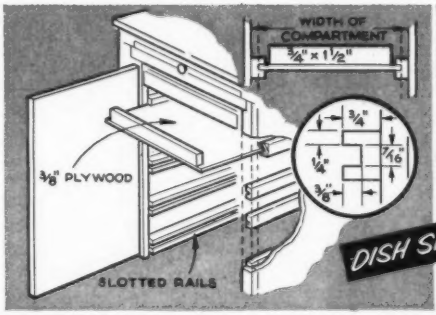


For any wall. My most expensive item for this reproduction of an early American spice chest was the knotty pine. Two 10′ boards—one ⅜″ by 5½″ and the other ⅜″ by 11½″—cost $3. Finishing materials and nails came to less than $2, bringing the total cost of the chest to less than $5.

Cut out the parts and nail and glue them together. A coping saw will handle the curves at the top. Aging the chest to give it that 150-year-old look is next. Peck it with an ice pick and round the corners with a file and sandpaper. Then scrub it here and there with a wire brush, being sure to brush with the grain.

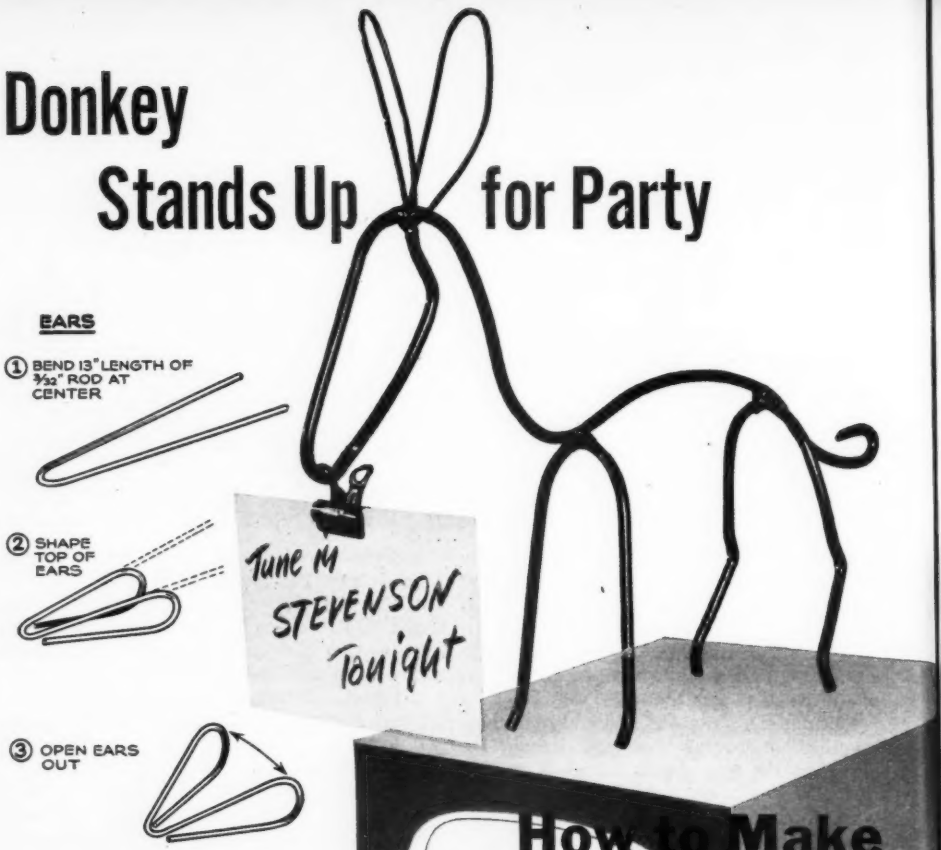
Staining comes next. Mix a little Van Dyke oil color with about two ounces of turpentine and a little linseed oil. More turpentine will make the stain soak in faster; more oil will slow the process. Try it on a scrap until you are satisfied and apply the stain with a cloth or brush.

When dry, sand all parts lightly with fine sandpaper. Then brush on two coats of dull varnish with a light sanding between coats.—*Carlton Strickland, Roanoke, Va.*

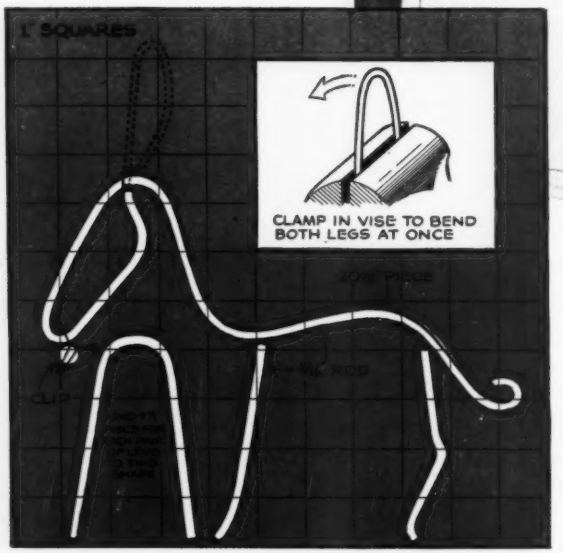


For the kitchen. These simple racks, installed in an existing cabinet, make dishes quickly accessible. Each sliding shelf is a piece of ⅜″ plywood with a narrow strip nailed and glued across the front to keep dishes from sliding off. Screw the slotted rails to the cabinet walls at spaces that will accommodate the dishes to be stored.—*Hi Sibley, Nuevo, Calif.*

Donkey Stands Up for Party



How to Make

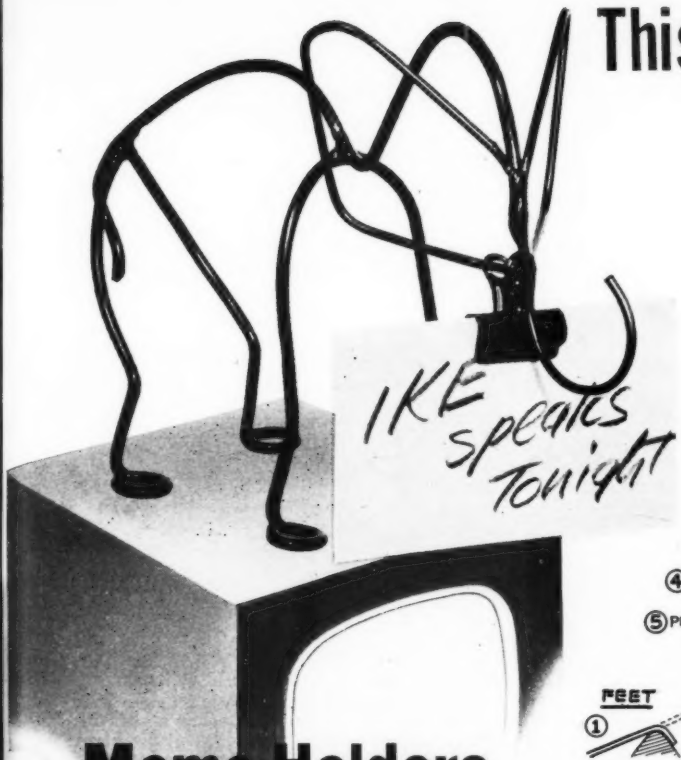


WITH the campaign waxing hot, here's a standing vote you can register for your choice. Besides reminding you of important radio or TV dates, such a memo holder serves as a center for family notes.

If welded, brazed or silver-soldered, the pieces will stand handling well. Any gas torch or blowtorch will do for silver-soldering the parts. If only soft-soldered, the pieces will serve as ornaments but will not bear much handling.

Lay out a full-size pattern as a bending guide. Shape the backbone and legs from 3/16″ steel rod, such as curtain rod. For a bending jig, drive two short ½″ pins into a metal block, spacing the holes to leave 3/16″ between the pins.

This Elephant Never Forgets



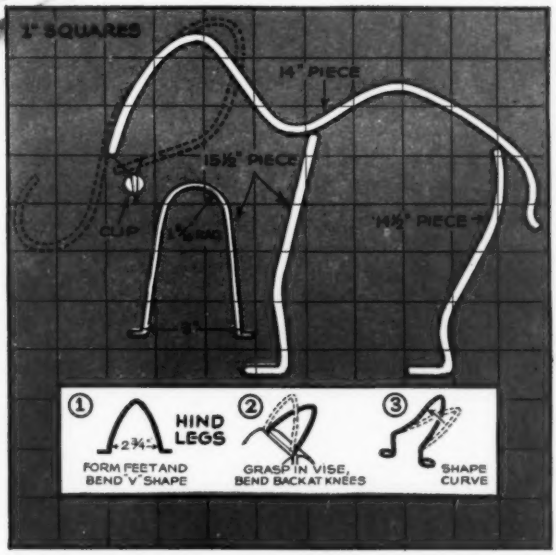
Memo Holders

Clamp the jig in a vise when bending stock in it.

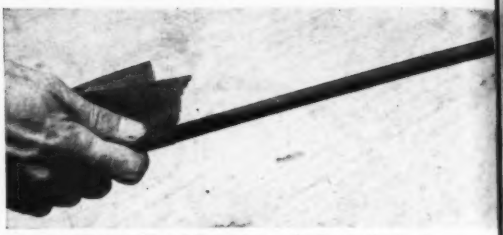
One piece of rod forms each pair of legs. Bend it at the center first. Then clamp the two legs in a vise to make all the other bends in both legs at once. Make ears of lighter rod to avoid overbalancing.

To hold the parts for welding or soldering, insert the donkey's feet in holes in a piece of wood. Clamp the elephant's to a flat surface. Clamp the backbone to one pair of legs while joining to the other.

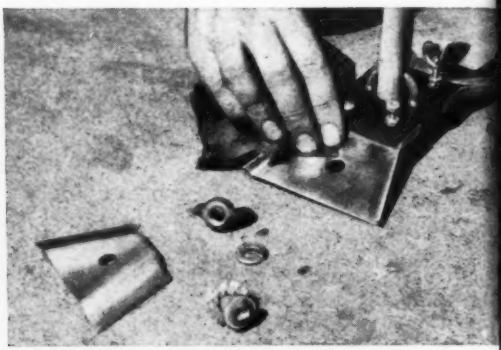
Spring-type paper clips are only soft-soldered on (so as not to take the temper out of the spring), the finger grips being bent to provide free action.



CHECK MOUNTING BRACKETS and replace if loose or corroded. If mast is more than 10′ high, brace it with guy wires. Aim wired arm at transmitter. Then, with someone at the set to advise you, rotate it slightly to chase ghosts and bring in full signal. If there are several possible locations on roof, try all.



CLEAN UP PARTS with emery cloth and steel wool. Take antenna down rather than try to reach up to it. Elements must be thoroughly brightened at joining ends. Other parts of rods can be cleaned for appearance.



BRIGHTEN INSIDE SURFACES of bracket so that it will make good electrical contact with the rods. Clean the insulating block with carbon tetrachloride. (Don't use sandpaper on the block; it will leave scratches that soon will accumulate dirt.) Disassemble the bracket completely before beginning job of cleaning.

TV Reception Slipping? It May Be Your Antenna

One rusty terminal screw can sabotage a chassisful of new tubes.

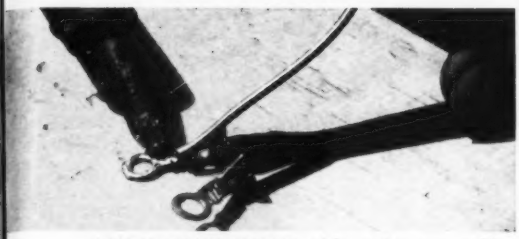
By John P. Kenneally

Rocket ships from "out there,"
Wrestlers flying through air,
Gave proof through the night,
That our antenna was still there.

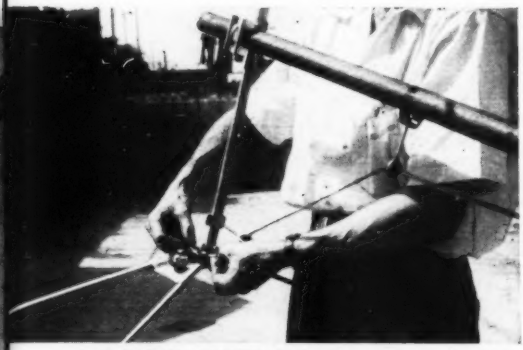
YES! It's still there, but months of weathering may have reduced its efficiency slowly and imperceptibly, eating away at your picture quality and bringing you snow in September.

It's time now, before winter moves in, to get up on the roof and check the other half of your TV set. The antenna has an important job to do; it must reach up and catch the TV signal from out of the air and feed it to the lead-in wire for delivery to the set. To do this, it must be in top condition both mechanically and electrically.

The best and safest idea is to loosen the mounting brackets and take the whole works, mast and all, down to the ground where it can be worked on more easily.



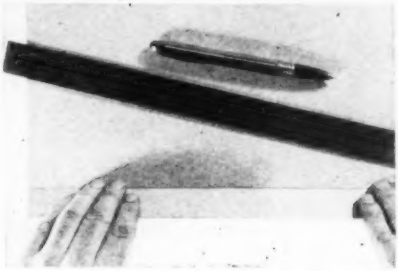
SOLDER CONNECTIONS with resin-core solder to prevent loosening and insure good electrical contact. Antenna is only as strong as its weakest point, so don't overlook anything. New lead-in wire will help if old is weathered.



REASSEMBLE ANTENNA and replace all rusty screws, especially the terminal screws, with brass or cadmium-plated ones. Use clamp-type stand-off insulators to support the lead-in wire along the mast. Place the first insulator close to the terminals to prevent the wire from whipping in the wind.

SHELLAC ALL JOINTS and connections after tightening them securely. Flow shellac between bracket parts and coat wing nuts to retard corrosion. Note very short length of unsupported wire between first stand-off insulator and terminals; this is important as wires will break if constantly flexed by wind.

Pen Creases Cardboard



WHEN working with cardboard, a ball-point pen is a good tool to scribe creases for folds. The point won't scuff or cut the cardboard. If you don't want the lines inked in, insert an empty cartridge in the pen.—*Andrew Brennan, Philadelphia.*

Stair Tread Pads Vise

A RECTANGULAR section cut from an old rubber stair tread makes a neat, no-slip, no-gouge pad for a small vise. A wide slot cut in the center of the pad will let it slip over the vise-tightening screw.—*R. F. Donavan, Guttenberg, N. J.*

Bumper Jack Supports Hitch

CARL BIERI of Latham, Mo., bolted a bumper jack to the hitch of his combine. This makes it easy to align the hitch with the tractor. It also supports the hitch when the combine is not being used.—*L. H. Houck, Jefferson City, Mo.*

How I Gave My Car

That Continental Look

Here's how to build a carrier that puts the spare tire out in back.

By Roland Loewen

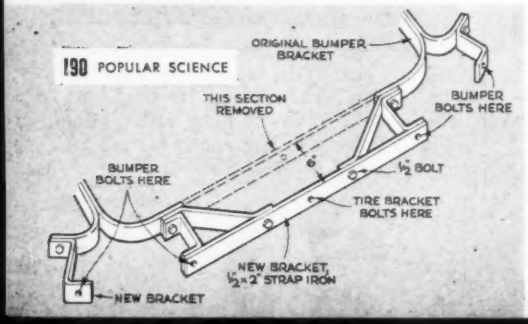
MOUNTING the spare tire behind the deck gives any car something of the racy swagger of the famous Lincoln Continental. It also leaves more room in the luggage compartment.

This is a popular customizing stunt nowadays, and several companies make a business of supplying necessary parts. But you may prefer to start from scratch, as I did, and save yourself money.

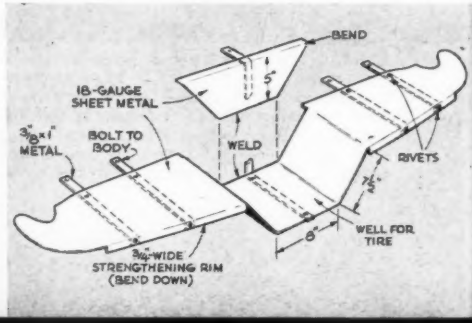
I added a Continental spare-tire carrier to a DeSoto convertible. The principles, if not the dimensions, could be applied to any other car. I moved the bumper back 6″ and added a new gravel pan to fill the increased space. A hinged bracket allows the tire to swing down for access to the luggage compartment. The bracket runs through a slot cut in the extra hub cap I bought, and the cap is bolted permanently to the bracket. Loosening one nut frees the wheel and tire. Instead of buying a metal tire cover, I chose one made of convertible-top fabric.

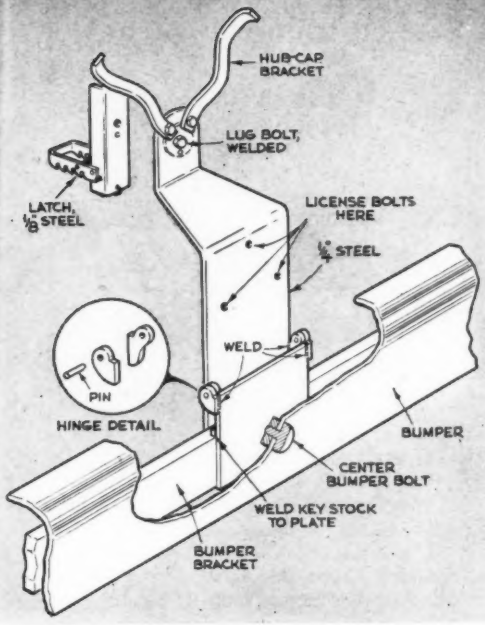
A machine shop did the bending and welding. An auto-top shop made the tire cover. Even so, my expenses ran less than $30.

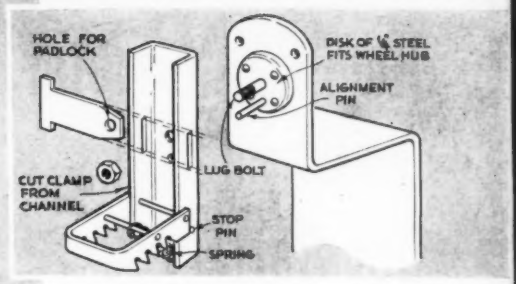
1 BUMPER WAS MOVED BACK 6″ by sawing out center section of old bracket and bolting on new parts made of ½″ by 2″ iron. Ends of old bracket were left bolted to car frame. Parts were assembled with ½″ bolts, and other ½″ holes were drilled for bumper bolts.



2 NEW GRAVEL SHIELD to fit wider space between the car body and bumper was cut from 18-gauge sheet metal. Old shield was used to make a cardboard pattern first. After shield had been bent down to form tire well, another piece was welded to the front edge.



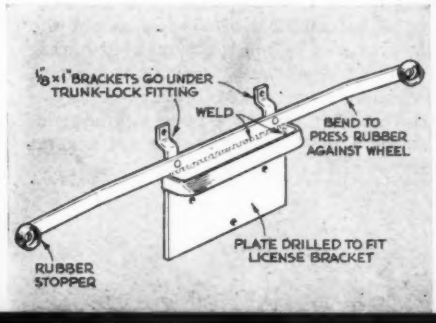




3 HINGED BRACKET made of 1/4" by 6" steel supports tire. A 6" piece of key stock welded to bottom plate keeps assembly square with bumper bracket. Size of carrier bracket was found by setting wheel in gravel-shield well. Steel disk bolted to front face keeps wheel in position, lug bolt welded through disk center keeps spare secure when nut is drawn up against clamp. Latter was cut from piece of channel. Pilot pin just below lug bolt keeps clamp vertical. Spring pulls latch against stop pin, and a lock prevents theft.

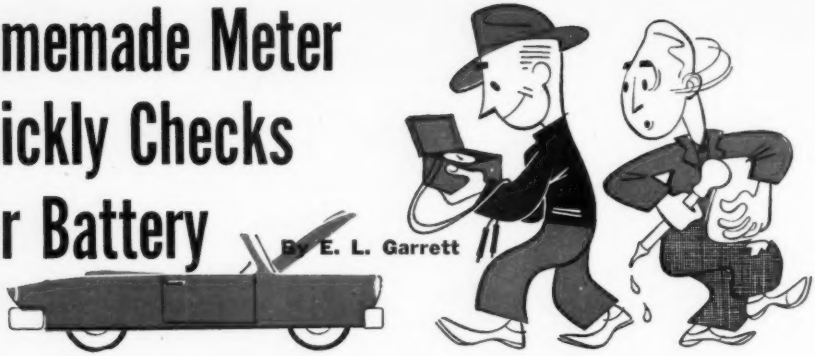
4 SLOT WAS CUT IN HUB CAP to slip the carrier through. Slot was made by drilling 1/4" holes and finishing with hack-saw and file. A bolt at bottom and bolted radial supports at top fasten cap to carrier. The supports, bent to conform to the tire, are joined at top by strip of sheet iron. License plate attached high on carrier hides slot in cap. Setscrews in bottom end bear against bumper bracket and keep the carrier and spare tire vertical.

5 NOTCHED LATCH ENGAGES CLIP bolted to deck lid to hold tire in running position. Deck fitting was removed and depressions filed out to take the drilled ends of brackets made from 1/8" by 1" iron. Rubber stoppers at ends of anti-rattle bar bear against wheel. Gravel shield and all parts of carrier were painted to match the car. License plate should have a shielded white light directed on it to meet legal requirements of most states.



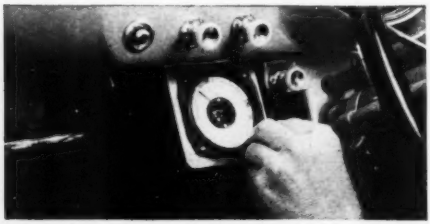
Homemade Meter Quickly Checks Car Battery

By E. L. Garrett



Modeled after a military tester, it measures voltage changes.

I HAVE a new way of checking my car battery. My homemade tester will do everything a hydrometer will do—and more—without spilling a drop of acid. It measures hairline voltage changes instead of chemical variations in the electrolyte.



Mounted in car, homemade tester gives a quick check on battery condition. For this use, it is permanently connected to one "pilot" battery cell through a push-button switch.

Signal Corps tester is more complex than home-built one. It has scales for tropic, normal and arctic batteries, all of which have different specific gravities. It tests open-circuit, light-load, and cranking and charging voltages and battery freezing point.

I built the tester, which is patterned after a Signal Corps design, for around $3.50, using surplus parts. With it, I can:

- Check the charge in each cell more quickly and easily than with a hydrometer.
- See how the battery stands up when the starter sucks out juice in fast-draining gulps—and get a tip of future trouble.

My tester is a voltmeter, but it gets down to much finer readings than those you see in garages. Voltage may be a tip-off if you can read the difference between the 2.12 volts of a fully charged cell and the 2.00 (at no load) of a discharged one. On the ordinary low-range voltmeter this .12-volt range may move the needle only 1/16".

The Signal Corps meter overcomes this difficulty by using a "suppressed zero" and an "expanded scale." This means that the pointer doesn't move until the voltage climbs past 1.5 and that the useful part of the scale, between 2.00 and 2.12 volts, is stretched out to almost half the total length. My meter, too, is stretched out, and on the scale each tenth of a volt is divided into five readily visible parts.

Construction. I built my tester around a surplus item called an ANP-1 Indicator*. This originally was a radio-altimeter indicating device used in planes. You must adjust the hairspring arms to spread out the scale, wire a couple of resistors in the circuit to push the voltage range upward, and make a new scale and calibrate it.

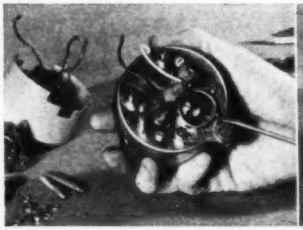
If you can't borrow a good voltmeter to calibrate a new scale, you can get a good

**I bought mine from Photocon Sales, 1060 N. Allen Ave., Pasadena 7, Calif.*

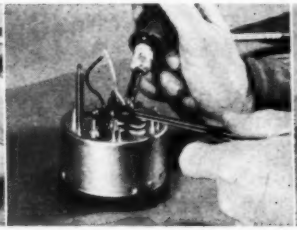
HOW TO BUILD THE TESTER

1 Basis of tester is this surplus ANP-1 indicator, bought by mail for $2.95. Basically it's a sensitive milliammeter.

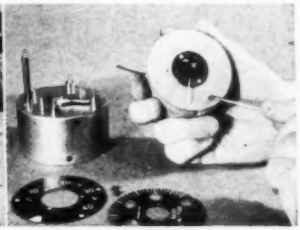
2 Other parts required are pictured here. You can get these from an electrical or radio-parts store. You also need a case.



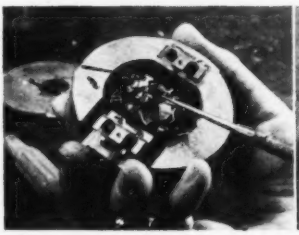
3 Clip off all wires leading to the connector, after removing back cover. Take out one of the two switches that you'll find on back.



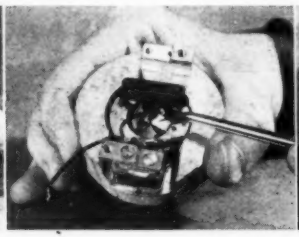
4 Unsolder the two leads from terminal strip to inside of case. Take out four flathead screws. Roundhead screws at rear release works.



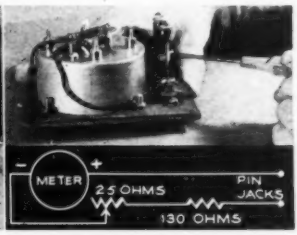
5 Discard original dial and movable disk under it. Your new paper dial will be glued to the plain metal facing indicated here.



6 Scrape black paint off star-shaped washer and off bottom bearing screws, using a sharp scriber. Then rotate upper hairspring arm fully counterclockwise, bottom one fully clockwise. This expands scale.



7 Insert tiny squares cut from new foam-rubber powder puff to cushion the two moving coil windings when they snap back to the low-scale position. This step is very important.



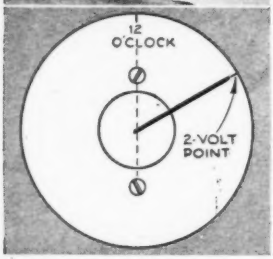
8 Connect parts as diagram shows and assemble on a panel. Calibrate a new scale as shown on next page after taping paper disk to meter face. *(Please turn page for finish of job.)*

idea of the open-circuit voltage points by checking several fully charged and discharged batteries with both a hydrometer and your tester. This will enable you to set enough points to complete the scale.

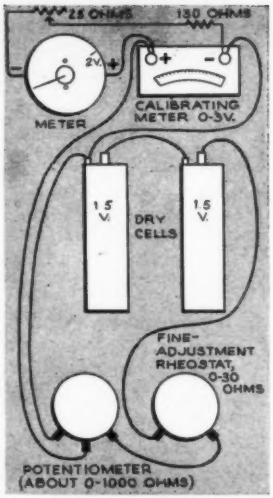
How it is used. The simplest test is to take readings across each of the three cells separately when there is no load on the battery. Experts do not agree on the value of this test, but I find it gives a quick report on how nearly charged the battery is (see voltage figures on next page). *Never connect the meter across the whole battery: six volts will damage it.*

Another procedure, the load test, is the best way of finding if a battery still has moxie. Warning of future failure shows up sooner on a load test than on an open-circuit one.

Simply take quick readings across each cell while the starter motor is turning the warm engine over with the ignition off. But make this test *only if the battery specific gravity is 1.250 or higher.* Don't run the starter more than 15 seconds at a time or you may damage it. The table on the next page shows you how to evaluate the voltage drop.



9 **Best way to calibrate scale** is to borrow a long-scale voltmeter, a potentiometer (about 0-1,000 ohms) and an adjustable rheostat (about 0-30 ohms). Hook these, the 25- and 130-ohm series resistors and two dry cells to your meter as at right. Set slider of 25-ohm resistor to mid-position. Adjust potentiometer to bring pointer to about two o'clock on blank scale (left) with exactly 2.00 volts going into meter. Mark the 2.00-volt point on dial. Then, to calibrate scale points above and below, adjust both potentiometer and rheostat. Mark points, remove dial and finish with India ink. Now assemble all parts on panel. As final step, again connect tester into calibrating circuit at right and adjust 25-ohm resistor to bring needle to 2.00-volt point after previously setting calibrating meter to 2.00-volts. Then clamp resistor slide permanently at this point.



10 **Finished dial** has two color scales, each divided into three parts. Color scale (left) beyond 2.00 volt mark shows poor, fair and good results for open-circuit tests. Color scale at left side of dial shows the same for cranking-load test.

11 **Mounted in a case,** the meter can be used this way to make open-circuit check of individual cells. For a cranking test, have helper step on the starter with ignition off.

CAR BATTERY TESTS

(Source: Signal Corps)

Hydrometer or Open Circuit

Specific Gravity (at 70° F.)	Voltage (no load)	Battery Condition
1.280	2.12	Good
1.260	2.10	
1.210	2.05	Fair
1.180	2.03	
1.150	2.00	Poor

Cranking-Load Voltage

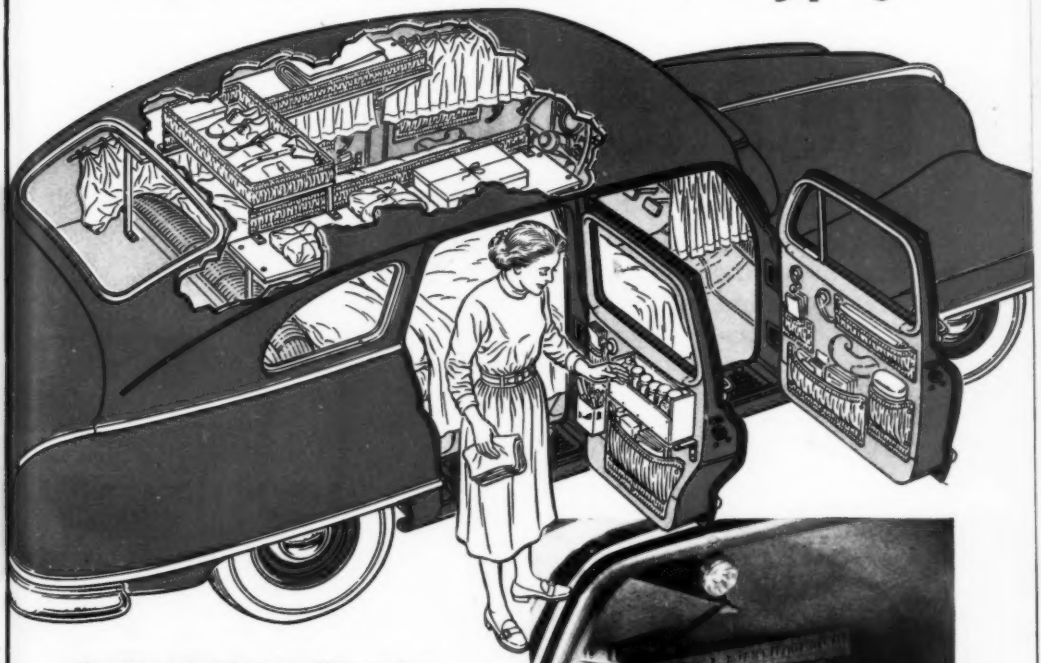
	1.66-1.48	Good
	1.48-1.32	Fair
	Below 1.32	Poor

Electrolyte Freezing Points

If Specific Gravity Is:	Or Cell Voltage Is:	Battery Will Freeze at:
1.141	1.89	10°F.
1.182	2.03	0°
1.214	2.05	-20°
1.232	2.08	-40°
1.246	2.10	-60°
1.260	2.11	-75°

FOR YOUR *POPULAR SCIENCE MONTHLY* INFORMATION FILE

How to Travel Like a Gypsy



Besides a bed for two, this car has other built-in conveniences that make it a real home on wheels.

PLENTY of Nashes have been sold with built-in beds. But in the 1949 model owned by Lucius Sheets of Huntington, Ind., a place to sleep is just the beginning of home conveniences. He can *live* in his. On a gypsy tour, gas, oil and food are his only expenses.

The right rear door is the meal center. Containers for coffee, tea, salt, pepper, sugar and flour fit into a narrow plywood box mounted just below the window. Silverware goes into a small box below. Such items as paper towels, napkins, dish towels and a tablecloth are carried in the two pockets. Perishable food is packed into an insulated picnic box.

A piece of plywood, stored under the seat, hooks to two brackets under the food shelf and serves as a table. Mr. and Mrs. Sheets find standing to eat a restful change from sitting while riding.

ALL SET FOR THE NIGHT. Curtains are drawn for privacy, and light overhead gives illumination for reading in bed. Pajamas and such are tucked into pockets at head of bed.

Pockets on other doors hold miscellaneous items—stationery, pen and pencils, business papers, maps, magazines, screens for the car windows. Sliding curtains hang on ½″ rods, giving night privacy.

The Sheets need no suitcases, for three shelves near the roof of the car offer space for clothing and toilet articles. The side shelves are 12″ wide and 9′ long. Elastic fabric keeps items on the shelves, which are supported by metal brackets. END

Gus Gets the Pitch

"Hurry, hurry, hurry!" spieled the carnival pitchmen, but the Model Garageman kept stalling as mysteriously as their new car.

By Martin Bunn

A HORN honked impatiently outside the Model Garage.

"I'll get it," Gus called back to Stan Hicks, his helper. "You'd better stick with that valve job for Mr. Landsdowne."

Two cars were parked out on the concrete by the gasoline pumps. A frayed knotted tow rope linked them. Gus recognized the tow car as the battered coupe belonging to old Jim Barstow who ran a sizable farm about 10 miles out of town. The car being towed looked as if it had just left the showroom.

"Newfangled Buggy" Breaks Down

"Got customers for ya," greeted Barstow as he unhooked a piece of baling wire and pushed open his door. "Broke down on the road out by my back 10. Happened to be cultivatin' and offered to tow 'em in."

"Thanks, Jim."

"Yep, that's the trouble with these newfangled buggies," Barstow rambled on. "Too many gadgets to get out of kilter. Well, I'll be seein' ya."

He tossed the tow rope into his car and clattered off down the road.

"Quite a character," said Gus with a chuckle to the two riders in the new car. "Now, how did your car happen to stall?"

"Just stalled, that's all," said the big man behind the wheel, in a voice like a saw sharpening a file.

"Yeah," echoed a small man sitting beside him, in equally rasping tones. "We were

"I'll just road-test it,"

breezin' along in fine style when all of a sudden no motor. It was like Chick, here, had turned off the ignition. I says to Chick—"

"Can the spiel, Sparks. We got no time for chatter. Let's get the car fixed and hit the road." He turned to Gus. "We're pitchmen, mister—you know, spielers—for the big carnival that's opening in the city and we gotta be there tonight to help stake out our act. Think you can help us in a hurry?"

"Try to," said Gus.

The big man eased his bulk out of the

said Gus, as he backed the car quickly out of the shop.

car and Gus slid in under the wheel. There was plenty of gas. The mileage showed less than 1,200—the car still had that new smell about it. But nothing would coax even a cough out of the engine.

Pitchman Tells Gus How to Fix It

"Let's push her into the shop," Gus said after a few tries, "where I can put some test instruments on her."

"Now, wait a minute," the man called Chick said. "This should be an easy thing to fix. I know a little about cars myself. It's plain enough that the engine just ain't getting any gas. Trouble's obviously somewhere in the carburetor, the fuel pump or the feed line. You ought to be able to find it there quick enough. We ain't got time for a fancy tune-up, so just check the fuel system and get us moving as quick as you can, huh?"

"You may be right," returned Gus evenly. "But I have to look a car over before *I* can spot the trouble."

"Okay, okay, let's get her inside."

The three men, with Gus reaching in

through the driver's window to steer, soon had the car parked beside Gus's bench.

"Ever have any trouble before?" asked Gus.

"Nope," answered Chick curtly.

"Been in a repair shop for a check-up?"

"Nope."

As Gus rolled his test panel over, the pitchman moved away and began to pace the garage nervously. His little sidekick paced right along with him. They seemed to be discussing something important in confidential tones. Gus began checking the ignition system—he felt sure the trouble was there somewhere.

After a few minutes, the little guy, Sparks, called out: "Making any progress, Pop?" He looked at a potato-size gold watch anchored to his vest by a heavy gold chain.

Gus ignored the little spieler and kept about his work of checking every wire and connection. On the surface everything seemed perfect, yet the ignition system was completely dead. The test rig bore him out.

There was only one thing to do, check each unit separately, so Gus started out with the battery leads.

Gus's Behavior Mystifies Stan

"Got an oversize battery in here, haven't you?" he asked, tapping the case with the tip of his screwdriver.

"Yeah, yeah," Chick said shortly. "Do a lot of cold-weather driving. . . . But never mind that. Haven't you located the trouble yet?"

Gus was checking the distributor now and he had an odd gleam in his eye. "Listen, mister," he said finally, "give me a little time, will you? This engine is new to me—I've never worked on a model like it before."

Over in the corner of the garage where he was working on the Landsdowne car, Stan glanced up in surprise. What did Gus mean by saying he wasn't familiar with that car? Doc Hanson had one just like it and they'd had it in the shop for a tune-up only last week. Gus's voice sounded funny, too—kind of Milquetoasty, as if he were extra anxious to please the big loud-talking pitchman.

But it seemed to suit Chick. For the first time he sounded almost genial when he said, "Well, all right, old-timer, but shake it up, will you? We're busy men and time's a-wastin'."

Road Test Rouses Carny Men's Wrath

Ten minutes later, after several trips to the stock room, Gus snapped the distributor cap into place and slid into the driver's seat. The engine started up smoothly.

"I'll just road-test it," he called out to the pitchmen and backed the car quickly out of the shop. Both men started to protest that they couldn't spare the time, but Gus was already headed down the road.

When Gus got back to the garage, he was greeted by two red-faced, fuming men, who, judging from the look on Stan Hicks' face, had been venting their anger on him.

"What's the idea?" Chick shouted. "You knew what a hurry we're in!"

"No idea. Just routine in this shop. We don't like customers to get a few miles down the road and find that what we thought we'd fixed isn't right after all. Matter of fact, she needs one more minor adjustment." Gus popped open the hood again. "Stan, come over here a minute, I've got a job for you." Gus whispered briefly. Stan nodded and left the garage.

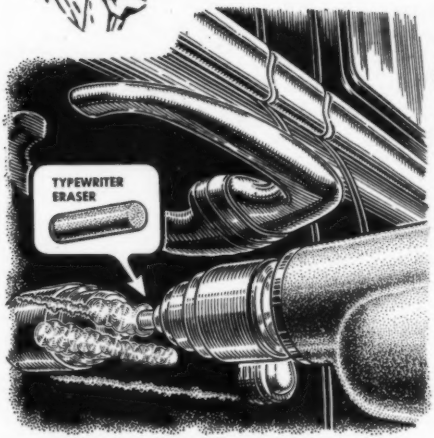
After a few minutes Gus closed the hood again. "There she is, boys, as good as new. That'll be $12.50."

"Well, it's about time," snapped Chick. The little fellow was already in the car when the big guy slid in and started backing out. Suddenly he stopped. "Hey," he yelled, "get that grease monkey of yours to back that tow truck out of the driveway. How in blazes do you expect me to back out?"

Stan climbed up into the driver's seat and

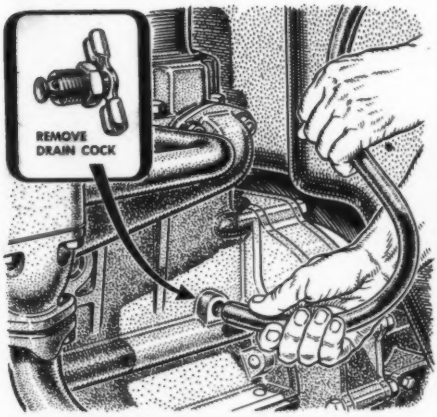
[*Continued on page 246*]

Hints from the Model Garage



Chucked in an electric drill, the gritty core of a pencil-type typewriter eraser makes it easy to touch up tiny rust spots on a car body without scratching the adjoining paint. The eraser will quickly remove the rust and clean the metal for painting.

A large baking pan kept in the trunk of your car is a neat container in which to place wet and muddy tire chains if you have to remove them along the road. Your wife may have an old battered pan that she would be willing to discard.

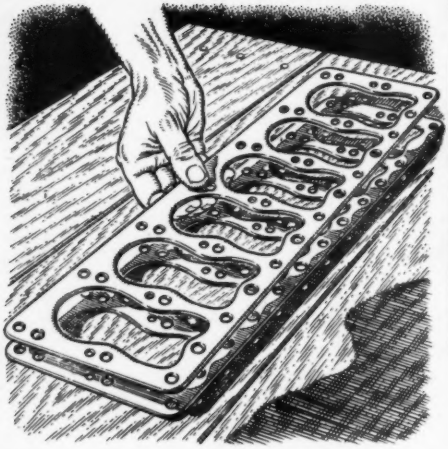


When draining coolant in cold weather, be sure a good stream runs freely from the block or you may have a costly freeze-up. If the water just dribbles out, remove the cock and use the blast from an air hose to loosen the sediment that can block drainage.

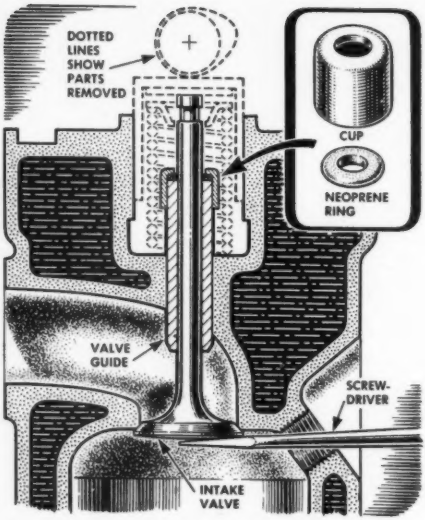
To pour antifreeze into the radiator from a large can, stand at the side of the car with the can extending into the engine compartment so that any dribbles get on the engine and not the body. The fluid won't hurt engine parts, but damages paint.

Please turn the page for more auto hints.

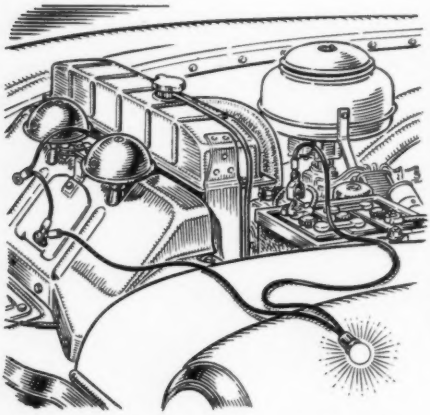
MORE Hints from the Model Garage



Check a new cylinder-head gasket before installing by matching it with the old one. If they are not identical, a vital water passage might be sealed off with disastrous results. Also, a black area on an old gasket indicates it has not been gastight. So be sure to tighten the head nuts according to specifications.



Oil consumption can be cut in a Crosley engine that has a cast-iron cylinder block by installing intake-valve seals just developed by the company. By removing the parts indicated, you can slip the neoprene sealing ring and steel retaining cup down against the guide. A screwdriver through the spark-plug hole will hold the valve up.



In repairing horn wiring, you can avoid the annoyance of frequent test blasts if you disconnect the wire leading to the horns and connect a test lamp to it and the battery. Use long leads to place the test lamp where it can be seen easily.

Drain holes in the base of a whip antenna sometimes get plugged with dirt, letting water accumulate in the tube. Poking a stiff wire through the holes will release the water and prevent possible interference with the operation of the radio.

Here's the Dope on Winter Tires

Tests by experts show what special tires can do on snow and ice.

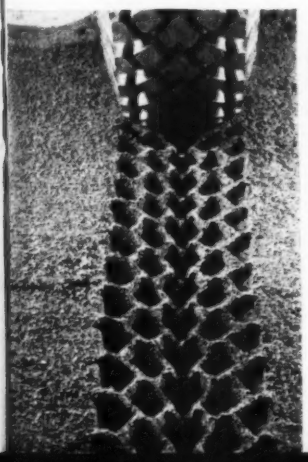
WINTER tires are a good buy if you don't expect too much of them. But they never will enable you to drive on snow and ice as freely as on a dry road.

When highways are slippery, tires have a tough time giving traction on hills, gripping the road when you apply the brakes and resisting corner skids.

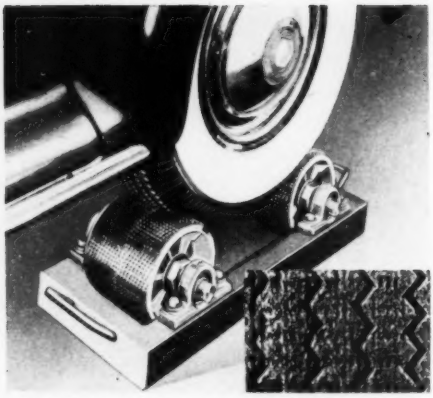
Several years ago the National Safety Council set out to find how representative winter treads compare with conventional tires in these three jobs. Mounting winter tires on the rear wheels of the test cars, the drivers tried them out on all winter highway conditions you might encounter—glare ice, rough ice, loosely packed snow and hard-packed snow. After the tests, the Council announced that:

- Progress has been made toward producing safer winter tires.
- Several specialized tires show definite improvements for specific conditions, but the over-all improvement is not enough to warrant less care on slippery surfaces.
- Several show some improvement under specific conditions, but they are no better under other conditions—and in some cases even worse—than conventional-tread natural-rubber tires.
- Natural-rubber tires are generally better than cold-synthetic ones.
- For the greatest safety and best traction under severe snow and ice conditions you still should use chains.

Types of winter tires. For its tests, the National Safety Council classified winter tires into three groups—winterized tires,



DIRECTION OF ROTATION is important with some mud-snow tires. If tread includes arrow-shaped knobs or similar pattern, mount tire so that points of arrows touch pavement first when wheel turns forward. This will throw mud and snow out of tread instead of letting it accumulate to destroy tire's traction.



TACK MACHINE winterizes conventional tires by making thousands of tiny holes in tread rubber. Sharp edges of these holes increase traction but tires will wear out faster. Tires also are sometimes winterized by grooving and slitting tread rubber to divide it into squares.

mud-snow tires and winterized mud-snow tires.

Winterized tires are essentially conventional ribbed tires with salt, sawdust or other fine particles embedded in the tread or having fine cuts or lacerations in the tread. Mud-snow tires have a special tread design—deep treads, studs or knobs. The third type is a combination of the other two —mud-snow tires that have been given a winterizing treatment.

Which is best? For the individual, there is no easy answer to this question. A tire's performance cannot be judged by its tread pattern or appearance. Within each of the three types, the Safety Council found varying performances.

But on the basis of test-result averages, a set of winterized mud-snow tires would be your best bet for all-around use, with mud-snow tires next, and the winterized type last. On glare ice, rough ice, and loosely packed snow winterized mud-snow tires showed an average improvement of about 25 percent over conventional tires. On hard-packed snow they proved to be 17 percent better in stopping ability and 19 percent better in traction.

Winterized mud-snow tires lagged a bit behind straight winterized tires, however, in stopping ability on glare ice. Of the winterized tires, those with lacerated treads came out better on glare ice and loosely packed snow than those with embedded materials. But winterized tires had less traction ability on hard snow than even conventional tires.

Mud-snow tires, as their name suggests, are of greatest value in loose snow, mud and, to a lesser extent, on packed snow. In general, tires of this group give you no benefits on glare ice.

Synthetics excel on corners. As the base line for its comparisons, the Council used conventional natural-rubber tires.

These were compared, too, with cold-synthetic tires. On glare ice and loose snow, natural rubber was 10 percent better in stopping performance and from 16 to 50 percent superior in traction. In cornering ability on glare ice, however, cold synthetic was seven percent better.

Chains are best. Even the best winter tires do not begin to give you the safety and traction of a good pair of chains. In comparison with conventional tires, the Safety Council found that reinforced chains improved stopping ability an average of 46 percent while traction went up a whopping 475 percent. So carry chains for severe conditions, even if you have winter tires.

Tire chains can be divided into three types—regular, reinforced and emergency. Regular chains have cross chains of a twisted-link construction familiar for half a century. In the reinforced type, the central half-dozen or so links of the cross chains are twisted more or have projecting teeth welded on. Emergency chains are cross links that wrap around the tires as a means of getting out of a difficult spot, like a mud hole.

Reinforced chains are rated highest because the design gives more traction, the added material lengthens the life expectancy of the chains, and the welded pieces, usually placed crosswise on the links, reduce skidding.

How fast to drive? As a guide for motorists, the National Safety Council has converted its test results into equivalent speeds. Using chains, you would have to hold your speed under 25 m.p.h. on glare ice and 35 on packed snow to have the same stopping ability you would at 50 m.p.h. on dry concrete with conventional tires.

With tires, conventional or any of the winter types, you would have to drop down to 15 m.p.h. or less on glare ice and down to 27 or 30 on packed snow. Even so, you probably would still be traveling too fast for safety.

No rule can be made that will tell how fast it's safe to drive under all conditions. That's something only you can judge.

How to Drive on Snow and Ice

Save This Issue for the Winter Ahead

When your tires have trouble keeping their grip, these rules will help carry you safely to your destination.

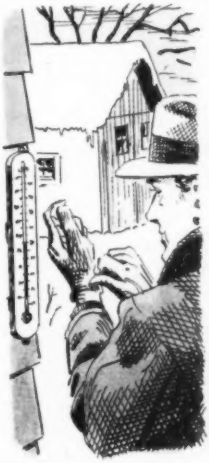
Get the feel of the road when you first start out. Driving slowly on a stretch of traffic-free road or street where you won't hit other cars, apply the brakes quickly enough to cause the wheels to skid. This will give you a feeling of just how slippery the surface is. But don't depend too much on this. The nature of the road surface may change unexpectedly. Watch especially for patches of glare ice ahead.

Never change speed or direction suddenly. Take it easy. If you hit the gas hard or let the clutch in with a jerk, your tires will spin because they'll lose what frictional grip they had. If you lock the wheels in trying to stop, you'll slide. If you take a turn too fast, centrifugal force may throw you into a skid. On ice, the best traction will be obtained if you keep the wheels from slipping. Tests have shown that spinning the tires reduces traction as much as 50 percent.

Pump brakes rapidly when you stop. It takes practice to do this effectively. Try it out on a dry road. Experienced drivers can do it with the rapidity of a machine gun. Leaving the clutch engaged, step on the brake, release it quickly and completely, and repeat the cycle until the car is so nearly stopped that you can keep the brake on and release clutch without causing a skid. Brakes must be in good condition so that they engage and release rapidly. In cars with conventional gearshift, there is a hazard in this method, however. Quick brake application may lock wheels momentarily. Since clutch is engaged, engine may stall, causing a bad skid. Skillful easing of the clutch may prevent stalling. This, too, deserves some practice on dry roads.

Adjust speed to road and weather conditions. On glare ice, with the best type of winter tires, it will take you around eight times as far to stop as on dry concrete. Even with chains the stopping distance is 3½ times as far. On packed snow, tires will carry you three times as far as on dry concrete before you stop, chains twice as far.

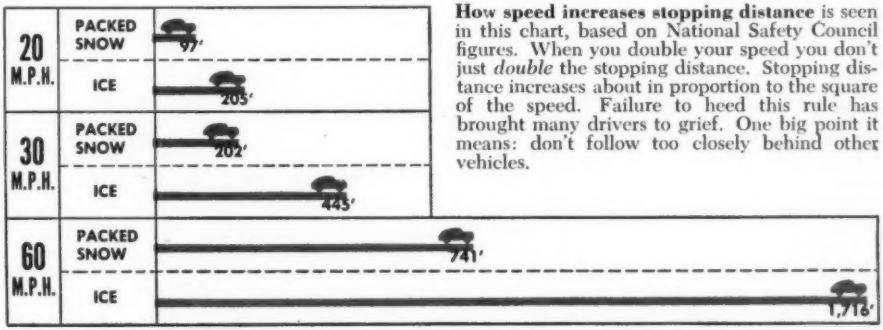
Watch the thermometer. Around 32°—the freezing temperature—glare ice is twice as slippery as it is at zero. This is because from about 25° up, the heat of tire friction spreads a thin film of water on the ice. In a series of tests, the National Safety Council found that stopping distances at 20 m.p.h. on glare ice may range from about 110 feet at zero to nearly 250 at temperatures near freezing. Council's tests of winter tires on glare ice described on the previous two pages were all made at a temperature of 20° to assure uniform slipperiness.



If you get stuck, you'll find it handy to have a short-handled shovel and a bag of sand, gravel or salt in the trunk. Don't wear out tires spinning them uselessly on a slippery surface. You can soon grind away a lot of rubber.

Bad driving conditions don't last forever. So, if at all possible, leave your car in the garage or travel another way.

How speed increases stopping distance is seen in this chart, based on National Safety Council figures. When you double your speed you don't just *double* the stopping distance. Stopping distance increases about in proportion to the square of the speed. Failure to heed this rule has brought many drivers to grief. One big point it means: don't follow too closely behind other vehicles.

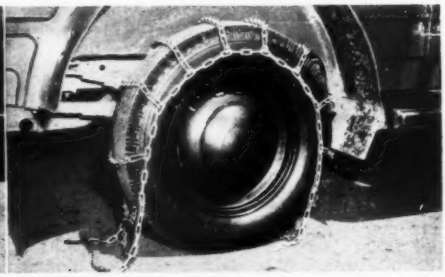


Please turn the page for more on winter driving.

Save This Issue for the Winter Ahead

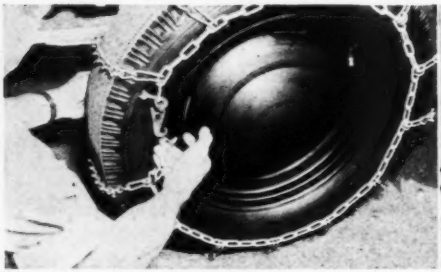
It's Easy to Put on Chains

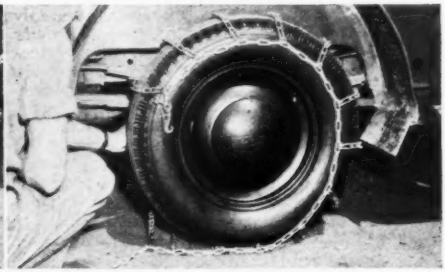
When this job confronts you, knowing the right way will save you time and effort. Here are approved procedures.



1 If you can get your hands over top of tire, spread out chains on ground beside wheels, like this, removing tangles and putting fasteners at rear. Put outside of chain up.

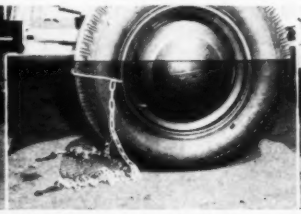
2 Then put your hands under middle of the chain, lift it up and drape over tire, like this. Adjust so first cross chain touches road in front of tire. Drape opposite chain same way.

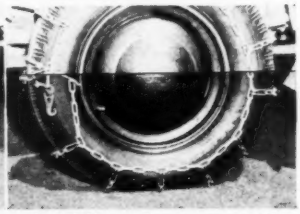




3 Drive vehicle forward until fasteners are about axle high or slightly under fender line. Then hold up *both* ends of chain to find proper links for hookup. Usually some end links must be dropped for proper hookup. Keep bottom cross chains straight across the tire.

4 Hook inside fastener into selected side chain link first. Then attach outside fastener, pulling chain as tight as possible by hand. Forcing a chain with tools or deflating and then inflating tires may damage tires. Chain should be free to work around tire.





1 Using a chain applier is best way if it's difficult to reach top of tire. Stretch out chains behind wheels, again with outside up and the fasteners to the rear.

2 Hang ends of chains on appliers and snap on the tires. Apply both chains at equal height and gather them close to tires as shown so they won't snag when car moves.

3 Roll car forward until fasteners are slightly under fender line (fender is removed here for clarity). Then remove applier, check for correct links and fasten chain tightly.

Foresight Assures Good Vision

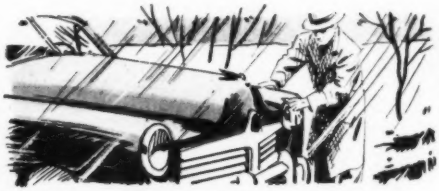
Save This Issue for the Winter Ahead

When you drive under hazardous conditions you have to see danger before you can avoid it. These tips can help.

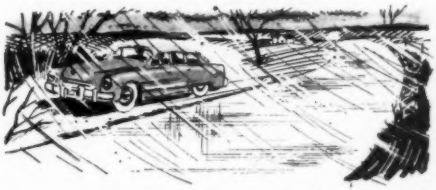
Carry windshield scraper in glove compartment to remove ice. Plastic scraper does good job without scratching glass. Garages and gas stations offer these as advertising giveaways. While parked, protect windshield with a cover, two squares of cardboard if nothing else.

Keep glass free of fog. When it tends to build up on inner surface of windshield, drive with vent pane open. Be sure the defroster is fully efficient. A sponge taped to back of one of your driving gloves will enable you to wipe windshield easily and quickly. But try to avoid driving with just a front peephole. Danger can come from the sides and rear, too.

Windshield wipers must exert more push to clear away snow. Weak wipers that serve satisfactorily during rain may stop completely when snow comes. So be sure that they are getting full vacuum, that the hose is good, that the mechanism is clean and oiled, that the blades make correct contact. Clean oil and scum from blades occasionally with a piece of cloth or paper.



Keep the headlights clean by washing away road spatter. And if ice builds up on windshield remember it may be blocking the light lenses, too. Don't let snow cover rear lamps.

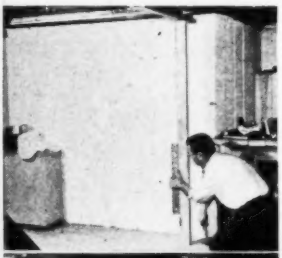


If swirling snow or driving rain reduces visibility almost to zero, get off the highway. Chances are conditions will improve shortly. You are not in that much of a hurry.

There's plenty of space in most basements. Here's how to turn it into rooms that add to the pleasure and value of your home.

How to Make a Basement More Useful

By Bernard Gladstone



END STUDS go up first. When they are placed under a steel beam make them a tight fit. Use level to plumb studs both ways.

PLATE should be a snug fit between the two end studs. Cut it long enough to be tapped into position and nail it to end studs.

SOLE also should be snug fit. Anchor it to concrete floor with cut steel nails. Then put up studs between the two end studs.

ONE day I walked down into our basement and stumbled over an old suitcase. The barked shin wasn't pleasant, but it did start me looking at and thinking about the cellar.

Here was almost half of the cubic space of our home. Mostly it was being used—if you can call it that—as a general catch-all for junk, like the suitcase I had just kicked aside. Along one wall I had my workbench and power saw. In a corner was the heating unit. On the other side of the basement was the laundry. The area in between was either littered with odds and ends or wasn't used at all.

That did it. I gave the suitcase another kick for good measure, climbed back up the stairs and started planning.

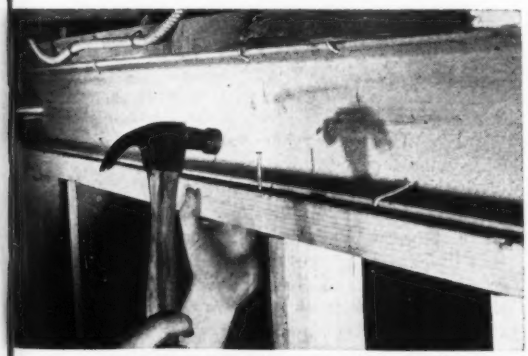
The result of the planning and a couple of months' spare-time work was a real basement. Now, instead of a smörgasbord of junk, I've got the following: a big playroom, a combination laundry-darkroom, a combination utility-storage room, a shop, a big walk-in closet for storing off-season clothing, and another closet for the kids' toys. The playroom serves a double purpose—it gets the kids out from under foot on rainy days, and in the evenings it's a fine

spot to entertain friends. It is warm in the winter and cool in the summer.

Assessing your basement. Before you pick up a tool, stop and consider your basement. You'll find there are lots of points to think about.

● Is it big enough? This means both vertically and horizontally. If the cellar is a little crypt to be crept into, you might as well forget it. But if it has adequate headroom throughout most or all of it, you have a good start—especially if it's a full basement.

● Is your basement damp? Naturally, if you find a spring under the basement floor, it can cost you plenty to seal off the water. (This happened to a friend of mine. He broke open the concrete floor where the water was seeping through, put in a sump pump and piped it outside to a ditch. He says the contractor promised him a full

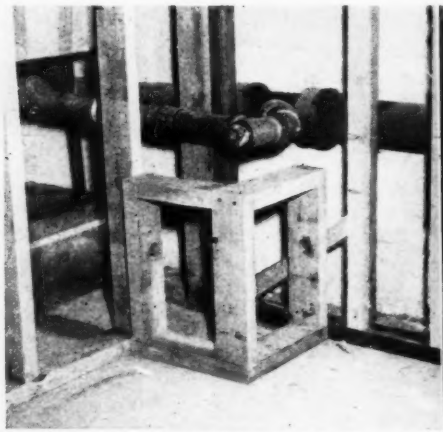


TENPENNY NAILS driven in plate and bent over flange will hold plate to I beam. If beam is wood, nail through plate and into beam.

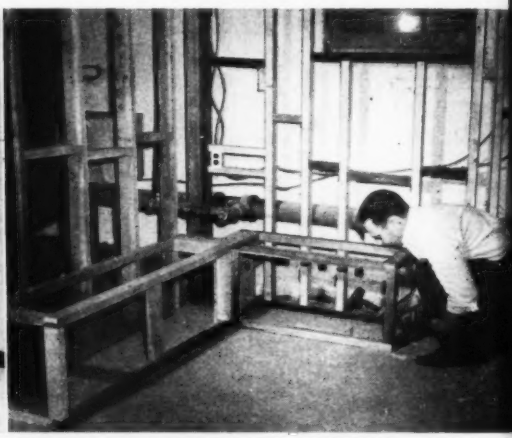
BOLTS through plate are another method of holding it to I beam. Use large washers under nut so they overlap flange.

PLATES that parallel but fall between joists can be secured by nailing them to short pieces that have been spiked between joists.

HORIZONTAL BLOCKING, also called firestopping and cats, is staggered so they can be end-nailed through the studs.



OBSTRUCTIONS should be utilized. Framing around projecting pipe will become corner table with removable top to get at waste plug.



BUILT-IN BENCHES flank corner table. Screws and angle bracket tie framework together. Cut steel nails anchor bottom pieces to floor.

basement and he would have it if it weren't for the pump.)

But if you have only some dampness—maybe a little seepage here and there—you probably can stop it by patching cracks with waterproof cement and giving the walls two coats of a waterproofing compound.

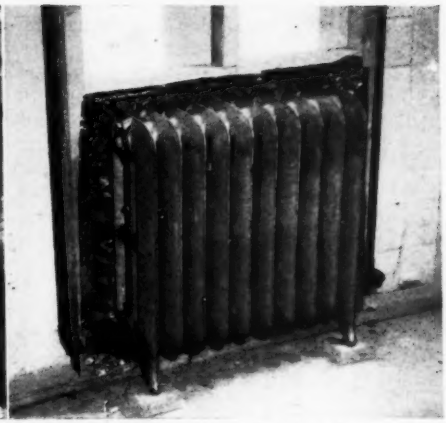
● What about pipes? Are they high enough or off to one side along a wall so they can be concealed, as mine were? Or do they have to be moved up between and through joists?

● Where are the basement windows? Outside light doesn't make any difference in a darkroom, but windows are certainly nice in a shop or laundry. So consider window locations when you make your plans.

● Is your basement warm enough? Many of them are, the heating plant radiating enough heat to keep the area comfortable. Then, too, the walls and ceiling you'll put in will help hold basement heat. I didn't think my basement would be warm enough, so I stuck a couple of radiators in the playroom. As it has turned out, I've seldom used them.

Drawing plans. Lay out a simple floor plan, indicating walls, columns, laundry

SPOTLIGHTS, sometimes called "high hats," are best located between joists. Simple framing of scrap lumber will hold them in place.



FRAME around openings for fuse boxes, radiators, windows and doorways. Aluminum foil behind radiators will throw heat out into room.

SHEETS of plasterboard can be nailed overhead by one man with the help of a T made of two-by-threes to hold up one end of sheet.

TAPE AND CEMENT cover plasterboard joints. Cement is spread along joint and tape pressed over it. More cement covers the tape.

equipment and the heating plant. Figure out how many rooms you want and how big they will be. Indicate where you want doors, partitions, closets and electrical outlets. Play around with different ideas by inking in the basement outline and sketching in the various possibilities on tracing paper.

Framing and walls. Two-by-threes are plenty big enough for studs, soles and plates. After all, the walls you will put up are not bearing walls—only partitions. How far you space the studs depends on what you use for walls. However, most standard wall coverings like plywood, plasterboard and hardboard come in 48″ widths. This means that studs spaced on 16″ centers—the usual spacing—will handle any of the standard boards.

I used Plankweld[1] for most of my walls. This comes in 16″-wide edge-grooved panels that lock together. The panels are made of various woods and are finished at the factory. You just put them up and have a finished wall—no painting or staining.

Wiring. In most towns it is acceptable for a homeowner to do his own wiring—

1. Made by United States Plywood Corp.

if he uses methods and materials that have been approved by local codes. Some communities also require a permit for electrical work and an inspection after it is finished.

Whether you have the work done or do it yourself, see that there are plenty of outlets (PSM, May '52, p. 210). And run separate circuits to shop motors, the washing machine and drier. Wiring, of course, must be done after the studding is up but before the walls and ceiling are installed.

As soon as I had my combination utility-storage room walled, the first thing I did was to stow away the old suitcase. It didn't do much good, though. One of the kids dragged the suitcase back out and, of course, I fell over it again.

Finishing touches—trim, closets, built-in furniture, hiding pipes and columns—will be detailed next month.

PLYWOOD panels were unpacked and spread out leaning against walls. Then they were shifted for the most pleasing grain effect.

STARTING in a corner, edge of first Plankweld panel is face-nailed to a stud. I used ¾″ No. 18 wire brads. Heads are slightly countersunk.

METAL CLIPS are inserted in opposite grooved edge and nailed to the next stud. Clips should be spaced about 19″ or 20″ apart.

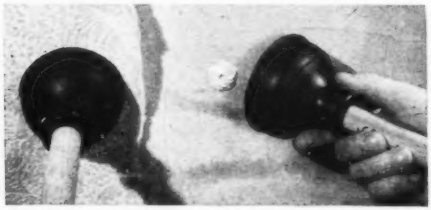
GROOVED EDGES of two panels overlap and lock together. The clips, hidden by panels, lock the grooves together tightly.

NEXT PANEL is tapped into place. Scrap of Plankweld with grooved edge is used as block so hammer won't damage edge of the panel.

Hoe Extends Paintbrush

For the occasional paint job that is too high to reach from the floor, clamp the brush handle to a hoe or other long-handled tool. This may save setting up a ladder for only a small area.—*Hugh Lineback, Stillwater, Okla.*

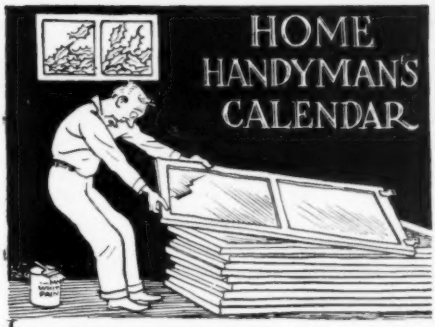
Suction Removes Wallpaper



Stubborn patches of wallpaper can be loosened with a plumber's suction cup. Just pump the cup repeatedly over the wet paper, as at left above. Another use is to help bond small plaster repairs (right). Fill the hole with patching plaster, force the cup over it, and then pry up one edge to kill the vacuum. Air pressure will force the patching material into all pores and crevices. —*Kenneth Murray, Colon, Mich.*

Toy Chest Closes Safely

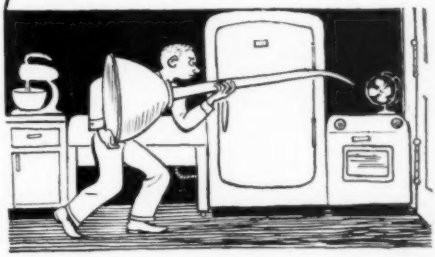
No more pinched fingers or painful bumps when the lid of this toy chest is closed. The safety gimmick is a plunger-type screen-door closer with the heavy spring removed. The light inner spring was left in place and nicely handles the weight of the lid. The closer is adjusted to lower the top slowly, eliminating slamming.—*John G. Voelker, Towson, Md.*



October Month of balmy days and autumn foliage, this is also the time to prepare in earnest for winter.

- Replace the screens with storm sash, and watch out for a stiff back in the bargain. Examine the weatherstripping, first checking the article on p. 230.
- Climb up on your roof for a thorough inspection. Look for loose shingles and nail down any you may find. Check trees for possible hazards over walks, driveway and utility lines. Ice storms or high winds can cause branches to snap, breaking light and phone lines, or even injuring someone. Clean leaves and twigs out of gutters, downspouts and drains. Examine the connections where gutters, leaders, downspouts and ground drains meet. Make sure they are tight. Paint galvanized sheet metal and canvas roofing. See that exterior drains, area drains and catch basins are clear of debris.

- Repair worn electric cords. Tighten or replace electric plugs on appliances. Replace darkened lamb bulbs. Clean and oil electric fans before you put them away for the winter.



How to Prevent Plumbing Freeze-Ups

By E. F. Lindsley

DIGGING UP FROZEN LINES is no outdoor sport. Only insurance against it is to lay pipes well below frost line. If it happens, electric thawing may save you lots of work. But it should be done by experts.

Keep Jack Frost out of your plumbing and your pocketbook by looking around now to forestall cold-weather trouble.

IT SHOULDN'T happen to your worst enemy. So let's invent a fictitious joker we'll call Emil J. Coleslaw. Emil and his wife decide on a midwinter vacation. Lightheartedly they turn off the gas, shut down the furnace, leave a note for the milkman and go off. The weather goes from mild to bitter and back again. They return to find:

- They need a new furnace. The boiler froze and burst.
- So did a pipe in the basement, which is knee deep in water.
- One toilet bowl has come to the parting of the ways, in three parts.
- The cracked flush tank is leaking water onto plaster in the room below.
- A puddle under the automatic washer can be traced to its pump, which will never be the same again and must be replaced.
- The electric well pump isn't working.

Although you won't have all the bad luck Emil did, even one chunk of it could be tough. The best job of pipe thawing is still the poorest kind of fun. So let's see what you can do to forestall those frozen-pipe blues.

Where is your lead-in? The lead to the house should be below the frost line, which varies from 1′ in Florida to 9′ in North Dakota. If somebody skimped on the pick-and-shovel detail, there isn't much you can do immediately except draw a map that will help you dig when there is snow on the ground, and pile insulating material along the route when the cold snaps are due.

Most freeze-ups occur when the bottom

SURPRISE LEAKS like these may be yours if you forget to shut off sill cocks for the winter. The first thaw tells the sad news. Valves seldom can be repaired, must be replaced. Hose can be ruined this way, too; drain and store it.

COLD-COUNTRY PRACTICE is to bring in a well lead through 4″ casing welded into well casing. This conducts warm air from indoors to the pipe. A screen over casing keeps out mice.

drops out of the thermometer and a high wind is blowing. Make a note of all spots where pipes are exposed. You may find some under crawl spaces, close to door or window openings, running through outside walls or between the house and garage.

In a brief cold snap, it may be practical to set up a small electric heater, an infrared bulb, or even an ordinary lamp bulb rigged to reflect heat on the pipe. But remember that any heat may create a fire hazard.

Keep them warm. You can pack exposed pipes with rock wool, cover them with asbestos paper or cement, or warm them with heat from the house. A good dodge for pipes in outside walls is to run in hot air from a cellar duct, using a 3″ conductor pipe up between the studs. So long as the furnace is going, the pipes will be safe.

Storm sash and weatherstripping can protect pipes running along a window opening. And don't shut off the heat in an unoccupied room if water pipes run through its outside wall.

In a pinch, there is the old dodge of letting the water run. A trickle should be enough. But don't do this if you have an electric pump, or you may find yourself with a burned-out motor.

Sometimes an outdoor line can be fitted with a shutoff valve and vent at the inside end. Then the outlet end in the garage or barn can be left open and the water drained, provided the pipe was laid with some down pitch, as it should have been.

Pipe through a barnyard can be kept open by stacking active manure along it. Leaves and compost-heap material will also serve. Even dry straw, shavings, wood chips, crumbled cork or vermiculite will help when the weather is not extreme, especially if the snowfall is early. Snow piled over insulating material adds considerable warmth-keeping ability of its own.

Going away? First of all, make sure you have a tight shutoff valve in the main supply line. A leaky one may slowly feed water to the flush tanks, water heater or automatic washer you left drained. If pipe drains are left open, you may come home to a flooded basement.

Draining water left in plumbing is as important as shutting off the supply. Pictures on the following pages show how to empty pipes and protect tanks and traps.

Thawing a freeze-up. Once old man winter has taken a bite on one of your pipes, the problem is to thaw it out. Where

TIPS ON THAWING

HOT WATER poured on rags wrapped around the freeze-up is a safe, time-honored method. A pail below catches runoff. Photo or infrared lamps might turn the trick here, too.

BLOWTORCH works fast, but be sure to locate freeze-up and work from faucet end back toward supply. Heating back of a blockage creates a sealed "boiler" not healthy to stand next to. Fire is a real hazard when torch is used. Sheet metal held as shown will protect wood and other combustible surfaces.

FROZEN PIPE IN AN OUTSIDE WALL is hard to reach. Flame can't be used because of fire hazard, but hot air can. Hook vacuum-cleaner hose to blower side and insert end into a pipe pushed up between studs. Apply a blowtorch to the pipe, which heats the air.

the block is can often be determined by feeling with your hands for the coldest spot. If you see a crack there, be prepared to stop the flood after thawing. Should there be no shutoff valve in the line, you'll have to close the main valve as soon as the pipe is thawed.

Small cracks can be wrapped with rubber tape and further sealed with roofing compound. Rubber hose, split and wired tightly around the break, may hold for a time. But if the break is serious, better not thaw it until you're prepared to install new pipe or cap off the run. If a valve is damaged, count on installing a new one.

What kind of heat? If the area around the pipe is still cold, first warm it up by whatever means you have. Even a portable oil stove will help make thawing easier and keep the pipe from freezing again.

Leave the water supply turned on while thawing, as the pressure will help unblock the pipe. A pail should be on hand to catch dribbles from a cracked pipe. Also open the faucet to show when water runs again.

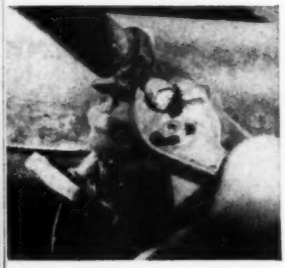
Anything from a blowtorch to a hot-water bottle can melt ice, but the danger of fire should be kept in mind—there's no percentage in thawing a pipe by burning down the house. *Always apply heat from the outlet end of the freeze, never behind it.* Otherwise you'll expand water behind the block and may burst the pipe.

Can I thaw pipes underground? This can be tough. If hot water or steam can be

WHEN YOU'RE GOING AWAY

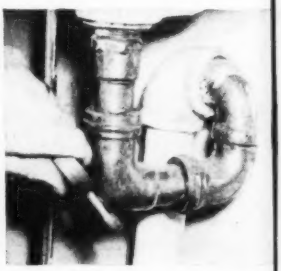
SHUT OFF MAIN VALVE FIRST. This installation is poor because lead-in and valve shown will remain full of water and may freeze. Valve with drain is better, shutoff being made at street valve. Be sure house valve is fully closed; corrosion may cause faulty seating, but tapping stem will usually make it seal.

EMPTY TANK by flushing toilet after house water supply is shut off and pipe drains in cellar are open. Then remove water from bowl with a siphon or rags and pour in antifreeze as a seal against sewer gases. Open lavatory faucets to admit air and let water in pipes out through pipe drains.



ALL PIPES should have drains at low points so that they can be emptied. This one is part of the shutoff valve. Drains may be hidden by ducts or partitions. Be sure to find them all. Use a wire to clean out rust or scale that may keep some of the water from draining.

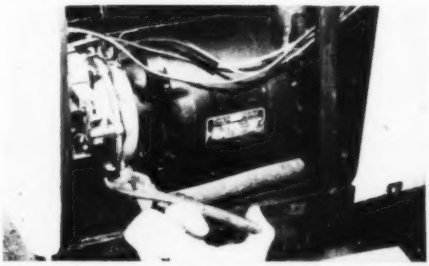
FREEZEPROOF all traps under sinks and basins by opening plug to drain them. Be sure to add kerosene or other antifreeze to seal the traps against sewer gases. A one-to-three solution of alcohol, or low-grade lubricating or vegetable oil, may be used as antifreeze.



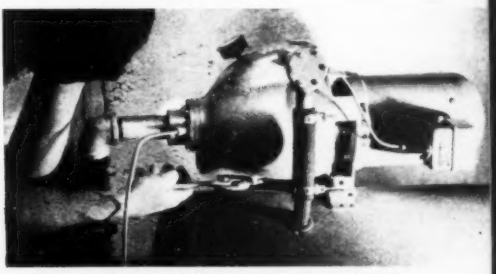
forced into the pipe, and the freeze-up is not too far away or extensive, it may thaw. The best bet is electric thawing. This calls for a heavy-duty arc welder (don't plan on doing anything ingenious with your house current). It also calls for expert know-how.

If the main line is frozen hard, you will probably do well to call the water company or a welder who can come around with a 300-ampere portable generator. He can shoot high amperage through the pipe, which will heat it up all along because of its resistance to the current. And he'll be wise to the pitfalls of the procedure, which include the risk of setting up a parallel circuit in a gas pipe or of melting a lead pipe fitting. END

IN MILD CLIMATES surface lines can be protected with insulating material and a water-shedding housing, here made of boards nailed into a trough form. Mica or vermiculite is cheap and, unlike straw, won't harbor vermin or lead them into the house. If snow falls, heap it up over the housing for extra insulation.



LOVE THAT AUTOMATIC WASHER? Then don't overlook water that may be left in the pump. If it freezes, the pump might be ruined. The easiest way to drain this one was to loosen its lower hose coupling as shown.



A WELL PUMP left full of water may freeze up and require costly repairs. Look for a drain valve or plug. Also open coupling at well to let water above soil drain back into well. Foot valve may hold some water in line.

DRAINING PLUMBING

Water left in pipes, traps, toilet bowls and flush tanks, washing machines or drains may freeze when a house is left unheated during cold weather. Even if an automatic heating system is left on, power or fuel failure may shut it down. It is safest to shut off the water supply and drain all pipes and receptacles. Check action of shutoff valve to make certain it cuts the supply off positively, and does not allow water to seep back and refill the lines you have drained.

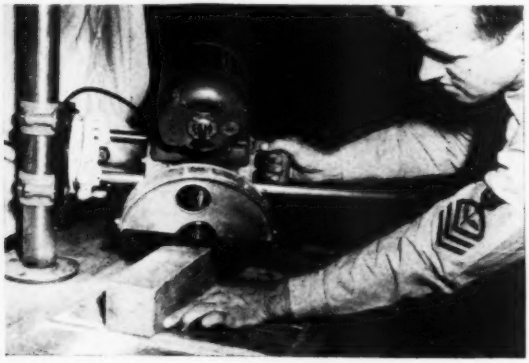
Check List

- Shut off main supply valve at street or in cellar
- Open all faucets
- Open pipe drains
- Disconnect pipes without drains
- Empty toilet flush tanks
- Remove water from toilet traps; add kerosene or other antifreeze
- Drain sink and lavatory traps; add antifreeze
- Drain steam boiler or hot-water heating system
- Turn off gas or electric water heater
- Drain water heater
- Drain water softener
- Drain furnace humidifier
- Drain water-fed home appliances such as washers and dishwashers
- Drain supply pump and tank; shut off power to well pump

FOR YOUR *POPULAR SCIENCE MONTHLY* INFORMATION FILE

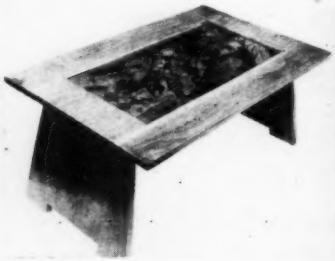
Craftsmen in Uniform

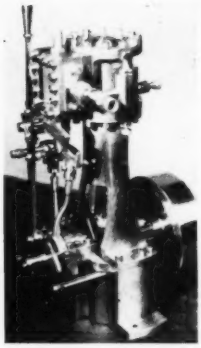
Bus into Auto-Home. The handsome motorized house at right started life as a 1941 Ford bus. Capt. Thomas A. Chrones, Air Force, stripped the bus, cut it apart (above) and inserted a new center section, increasing the over-all length to 35′. He installed a complete bathroom and kitchen and laid a rubber-tile floor. The interior is lined with spun-glass insulation, plywood-covered. The engine is a 112-hp. Mercury. His only power tools an 8″ table saw and an electric drill, Captain Chrones spent 1,600 hours and $3,100 on the job. He's at Lowry Base, Colo.



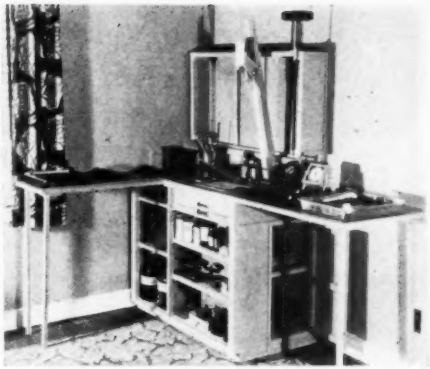
Plane Turret into Power Saw. A ball turret from the scrap heap of an aircraft-salvage company supplied most of the parts for the 10″ power saw at left. James Jurel, Chief Aviation Machinist's Mate, USN, got the idea from a new tool that he saw in PSM. The upright is extra-heavy pipe; the blade guard was the top of an oilcan. The saw will rip, cut off, shape, plow, rabbet, dado, disk-sand, wire-brush and grind. It has a 21″ movement. Jurel spent $7.50 on parts, other than motor, mandrel and blade.

Pictures in Leather. When M/Sgt. Ben P. Moody creates a picture he uses leather. The panel set into the top of the coffee table below was carved, then worked from behind to raise the relief to 1″. It is covered with glass. Sergeant Moody, in Germany with the Army Medical Corps, has twice won world-wide Army crafts contests.





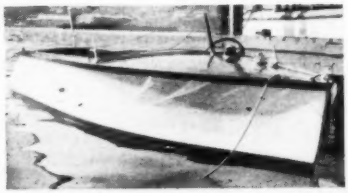
Iron Pony. The midget steam engine at left develops almost one horsepower when run at 1,500 r.p.m. with 100-lb. steam pressure. It stands just 7¾″ from base to top of cylinder cap, has a 1¼″ bore and a 1″ stroke. The cylinder is cast iron; the standard, brass; the crankshaft, steel. Herbert Grathwohl, Machinery Repairman Third Class, USN, machined parts from solid stock. Steam at 125-lb. pressure comes from a coal-fired 21-tube copper boiler, also built by Grathwohl, who is serving aboard the USS *Arcadia*. The whole job, including a water pump, valves and accessories, took him a year's spare time.



Living-Room Photo Lab. Shown opened out ready for use, the portable darkroom setup above folds compactly into the central base unit when not needed. It was built by H. D. Stewart, Chief Parachute Rigger, Naval Air Station, Lakehurst, N. J.

King Midget Winner to Be Announced

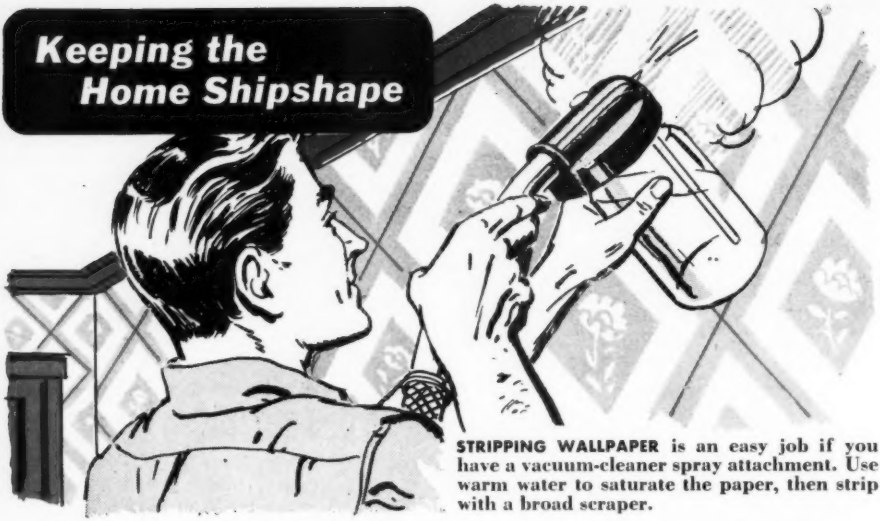
WHICH of the many items that have appeared in this department since last spring do you consider the finest example of craftwork by a man in uniform? That's the question the judges are pondering now. Next month their decision will be announced—and a King Midget automobile will be shipped immediately to the lucky fellow. The manufacturer will send it anywhere in the continental U. S.



One Man's Navy. When Lt. R. T. Higgins, USN, is not afloat for the Navy he can go to sea in his own craft—the 16′ V-bottom inboard runabout above. It's framed with white oak, the planking is Douglas Fir, topsides and cockpit are mahogany. When stationed at Guantanamo, Cuba, Lieutenant Higgins spent 15 months of off-duty hours —plus three weeks' leave—on the project. A four-cylinder, 47-horsepower converted Hercules IXB-5 drives her at an estimated 25 knots.

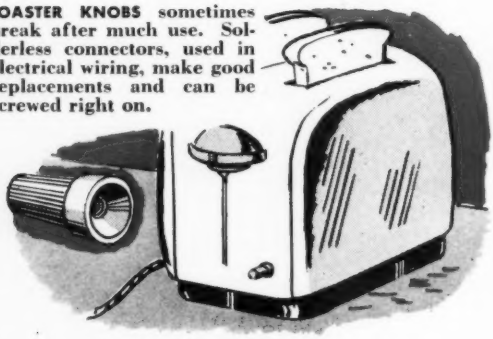
Boy-Powered Crane. A young operator can climb into the cab of this "Kiddie Crane" and run it himself. Foot pedals rotate the carriage, raise the boom and maneuver the hook, separately or together. Lt. Comdr. J. V. Bartlett, of the Navy's Civil Engineer Corps, built the crane. He lives in Falls Church, Va.

Keeping the Home Shipshape



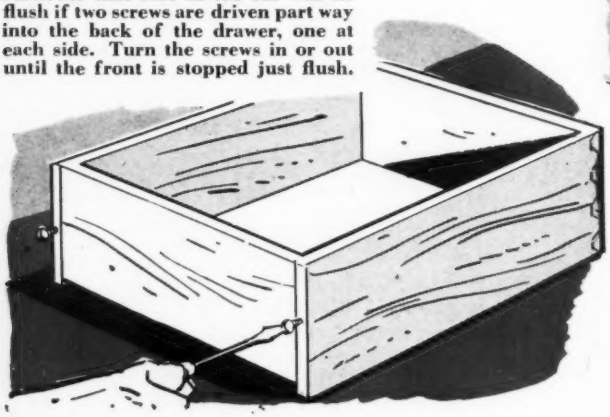
STRIPPING WALLPAPER is an easy job if you have a vacuum-cleaner spray attachment. Use warm water to saturate the paper, then strip with a broad scraper.

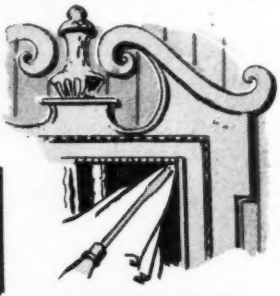
TOASTER KNOBS sometimes break after much use. Solderless connectors, used in electrical wiring, make good replacements and can be screwed right on.



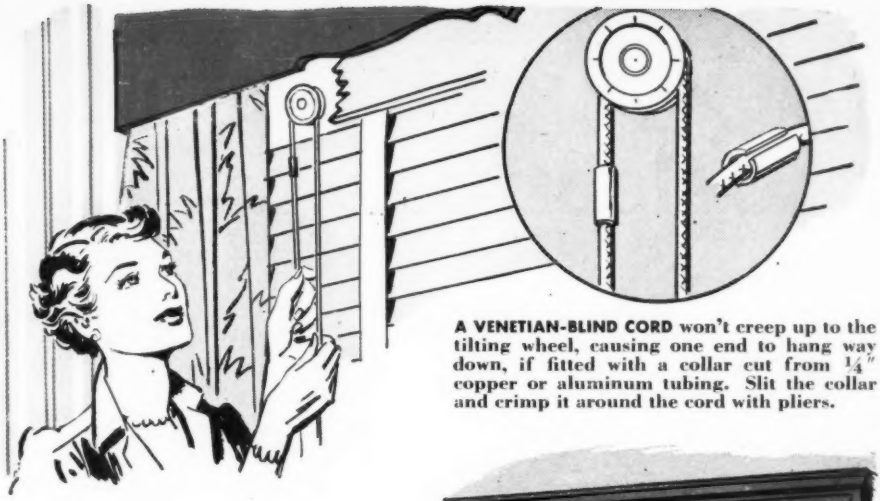
NO BASEMENT LAUNDRY TUB? A worn-out washer with works removed and hole plugged will do the same jobs. Install wall faucets for filling the tub; it will roll to the basement drain for emptying.

DRAWERS that ride in too far will fit flush if two screws are driven part way into the back of the drawer, one at each side. Turn the screws in or out until the front is stopped just flush.





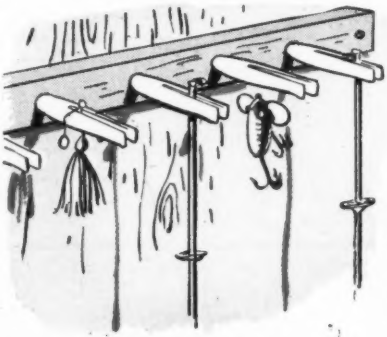
FOR CLEANING MIRRORS, a small screwdriver folded inside a chamois reaches into corners better than blunt fingers and cleans up to glass edge without touching a delicate frame.



A VENETIAN-BLIND CORD won't creep up to the tilting wheel, causing one end to hang way down, if fitted with a collar cut from ¼" copper or aluminum tubing. Slit the collar and crimp it around the cord with pliers.

CHAMOIS SKINS for window and car washing can be cut from old jackets of thin suede. Clean the leather in heavy suds, then soak to remove any unfixed dye.

CHEAP STENCILS for spray painting jobs can be made from lace paper doilies. Cut apart and taped to the surface to be painted, they form borders or corner designs.



THIS FISHERMAN'S RACK is simple to make. It's just a strip of wood with headless clothespins inserted.

A TABLE TROUGH cut down from an old end table will keep the family reading tidily at hand. Or it will hold a generous supply of popcorn or fruit for between-meal snacks.

How Karsh Pictures Celebrities

Focusing on the famous took this Ottawa photographer to the top of the heap himself.

By Devon Francis

YOUSUF KARSH of Ottawa, the world's most celebrated portrait photographer, is a mild-mannered little fellow who probably has taken more abuse than any other man in his business.

"Here I am, 8:07 in the morning," Lord Tedder, then Marshal of the Royal Air Force, grumbled to Karsh when he arrived for a sitting in London. "I'm late and I hate your guts."

Karsh has been similarly castigated, sometimes without overtones of affection, by John L. Lewis, Lord Beaverbrook and a fair percentage of the hundreds of other famous men he has etched on film in the last decade. He doesn't mind. In fact, he encourages it.

They All Pay Homage

And by some perverse alchemy the most difficult of his subjects wind up paying homage to him. It was Beaverbrook, by turns angry and arrogant at his sitting, who gave Karsh the ultimate accolade when he saw the results:

"Karsh, you have immortalized me."

Karsh has a gift for waspish riposte. Artur Rubinstein, the pianist, arriving in Ottawa at 1:30 in the morning, telephoned Karsh at home to say that his plane had been late.

"How long will this sitting take?" asked he impatiently.

"Until we are both exhausted!" snapped Karsh.

It was a subdued Rubinstein who showed up at the studio a few hours later.

That's only one side of the man Karsh. By nature he is gentle. He abhors conflict. He is courteous to a fault. No man ever followed him through a doorway. His occasional barbed tongue is a product of his interminable worry over his work.

He is never satisfied. Before a major sitting he is likely to walk the floor all night. That, oddly, he finds is good—he is at his best when he is tired and taut.

The man who took the world-famous picture of Winston Churchill without his cigar is an artist, but he is more. He is an actor, psychologist and superb technician as well. Tailoring his mood to that of his subject, he can wheedle, glower in anger, coax, threaten or dissolve in speechless indignation, all in a matter of minutes. None of this is synthetic. It is a part of him.

How He Prepares for a Sitting

If there is any one secret to Karsh's success, it is his meticulous study of his subject before he loads his camera. He reads up voraciously on his man, sometimes for weeks, beforehand. When the time comes for the sitting, Karsh knows not only whether his subject reacts to a discussion of rural electrification or Renoir, but how, and what he eats for breakfast. More, he knows what expression will kindle the personality.

The faces of people seated before the

Pose of Churchill in belligerent mood in dark days of 1941 first put Karsh in the limelight.

HER MAJESTY Queen Elizabeth II, photographed by Karsh at Clarence House just before her North American tour—while she was still Her Royal Highness the Princess Elizabeth.

HUMPHREY BOGART. Instead of a villain of the films, Karsh found a gracious and suave host. "I found nothing of the rugged low-brow of his movie roles," said Karsh. "So I tried to portray him with the modulations of tone which bring out his interesting features."

Karsh camera are brought alive by pointed questions from the man behind it. Photographing Jean Sibelius, the great Finnish composer, Karsh brought the magnificent face into relief by telling him how his fellow Finns obtained a rebirth of spirit in troubled hours by listening to his epic work *Finlandia*.

The resulting picture was good, but something was lacking. Karsh had not characterized his man. He was in agony. What was wrong? Then, like a flash, he had it. Seeking words to express himself, Sibelius kept closing his eyes. Karsh caught him that way. Some critics consider it his finest picture.

How He Became a Photographer

The Karsh story is pure Horatio Alger—Immigrant Boy Makes Good. Born 44 years ago in Turkish Armenia at a time when massacres of Christians were politically fashionable, Karsh at 15 emigrated to Canada to live with an uncle named Nakash in Sherbrooke, Que. He wanted to be a doctor. The uncle was a photographer. Karsh began dabbling.

When he won $50 in an amateur photo contest in Toronto, he was lost to medicine forever. Later he studied with the late John H. Garo in Boston. Aside from being a fine photographer, Garo was a man with a heart.

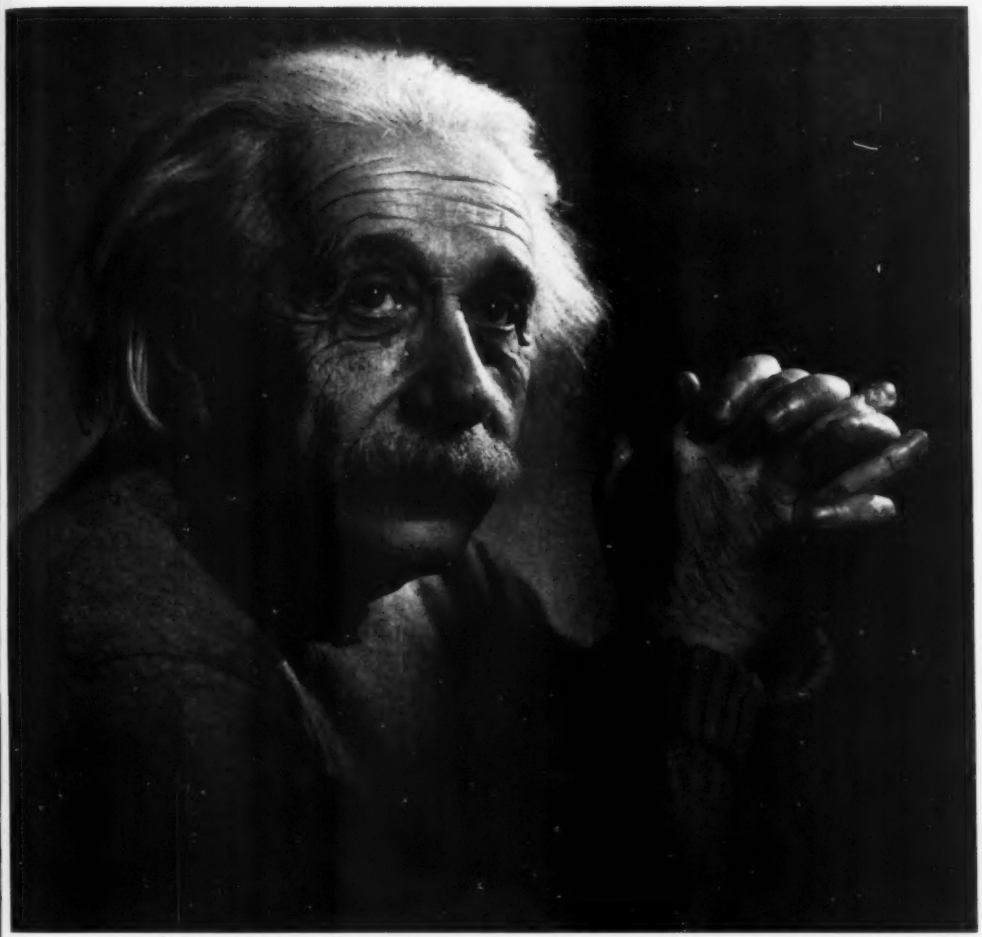
"I learned the humanities from him," remarks Karsh. "I also got a tremendous technical discipline—I learned light control."

Karsh established a little studio in the Dominion capital in 1933. He borrowed $150 to buy his equipment. Business was slow. He had to ask his secretary for $17 toward the first month's rent. Things rocked along indifferently for him until 1939 when he married a French girl named Solange Gauthier.

Churchill Portrait Made Him Famous

Madame Karsh had a shrewd business head. She also had charm and a flair for the dramatic. Business began picking up. Karsh began meeting the right people. Both the Karshes had been interested in the Ottawa Little Theater, where Karsh had been studying stage lighting from a camera standpoint, and it was there that he became acquainted with Lord Duncannon, son of the then governor general, Lord Bessborough.

Presently he had his first major assignment—photographing the governor general and his lady. Other big jobs followed. In 1941 he made the famous Churchill study,



ALBERT EINSTEIN. Hands frequently are prominent in Karsh photos and that is how he chose to portray the great mathematician in this eloquent portrait made at Princeton.

and almost overnight Karsh found himself not Yousuf Karsh, the Ottawa photographer, but Karsh of Ottawa, internationally known photographic portraitist.

Planning Is Torture

Yet planning a portrait is torture for him. He is haunted by the thought that he won't get what he wants. He is so profoundly affected in the midst of a big job that he has, on occasion, lost his voice. That happened when he photographed Pope Pius XII. His excitement reached such a pitch that he almost fainted.

Yet he can go home in the afternoon, announce that he is going to take a 45-minute nap, and sleep like a baby.

The Karsh home on the Rindeau river a few miles from Ottawa, with immense expanses of glass in the walls, is a show place. It is balm for his soul, from its big stands of white birches, Lombardy poplars, Norway weeping spruces and one European larch to the door on his two-car garage which opens automatically by radio signal when he flips a switch in his car.

None of his pictures adorn his walls. He says that nature provides better pictures through his windows than those he can make.

Karsh is on the road most of the time

taking pictures, and with him is Madame Karsh who doubles in brass as wife and business manager. When they return to the sanctuary of their home, called "Little Wings," he gets up at 4:30 in the morning just to roam over his five acres and listen to the birds and look at his trees.

He Also Makes Speeches

Despite only four months of formal Canadian schooling, Karsh has a command of the English language that would shame a native. His sentences have a poetic quality. In a recent speech—he is in great demand as a speaker—he said, "I had not the good fortune to be a son of this land."

To a class in press photography at Ohio's Kent State University last year he said:

"The portrait should tell not just that X has a heavy jaw and Y drooping eyelids; it should convey the message that here we have a man of will power, iron determination, singleness of purpose; that here is a thoughtful, perhaps calculating, perhaps careful man who weighs and ponders before he makes up his mind . . .

"There is infinite subtlety, limitless range in the shades of complex meanings lights and shade can produce. They are the portraitist's tools . . . "

And of his own work: "My great hope is that these portraits will be considered as contemporary historical documents."

A linguist, Karsh is equally fluent in French and Arabic. But because he learned his English by ear, his spelling of it is phonetic and consequently abominable. His French and English come out with a Near East accent.

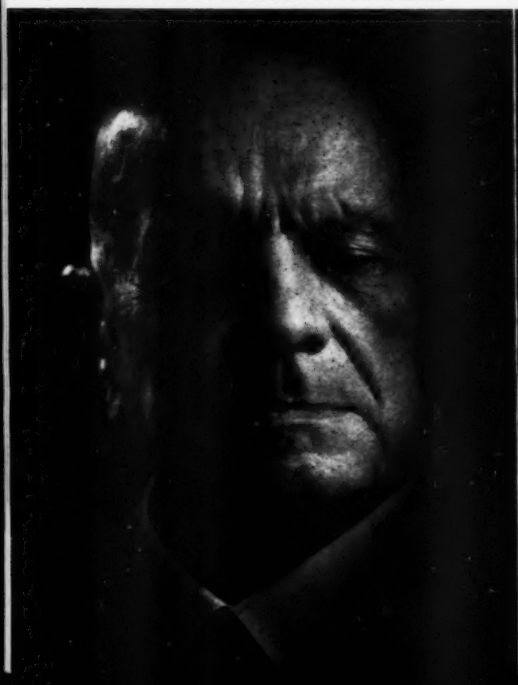
Karsh is as impeccable in his appearance as in his grammar. His attire is simple but flawless. It clothes a dignity that produces anything but incongruity with his less-than-average height. Only his intimates feel secure in calling him by his first name.

Karsh of Ottawa is also Karsh of New York and London. He keeps identical equipment in the other two cities. When he takes a trip into the hinterlands, his gear folds neatly into half a dozen boxes weighing exactly 250 pounds.

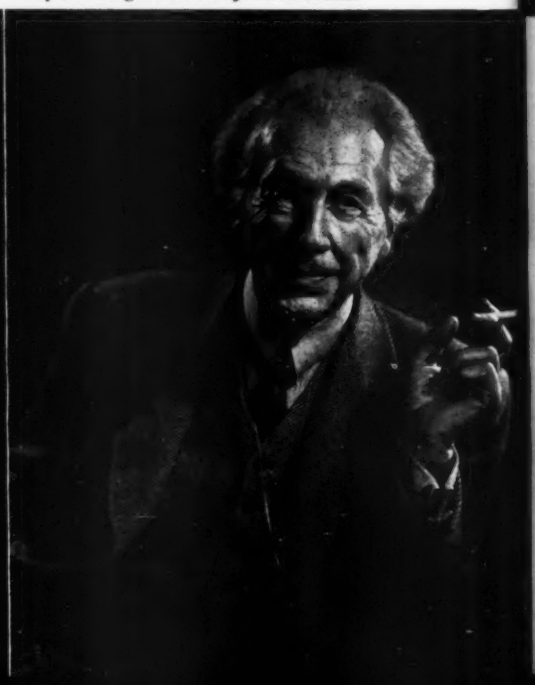
He always travels by air. Arrived, he orders a suite with two bathrooms. One becomes a darkroom. He can't wait to get home to see how his pictures turn out.

The Karsh studio in Ottawa is in the Hardy Arcade at 130 Sparks St. At the Arcade entrance is a simple business announcement: "Karsh." A current portrait flanks it. The two-story building is a walk-

JEAN SIBELIUS, famous Finnish composer, has a habit of closing his eyes as he seeks words to express himself. Karsh selected this moment as most characteristic of the man.



FRANK LLOYD WRIGHT. "Your wonderful portrait makes me the American Voltaire," the famous architect told Karsh. Smoking is one way Karsh gets his subjects to relax.



INGRID BERGMAN was completely "unmade up" when the Ottawa photographer visited her home for this informal picture.

up. In the second-floor directory, sandwiched in among such firms as Moto-Mix Concrete, Ltd., and the Bruce Coal Co., is the studio room number.

His reception room, with a red rug, is unpretentious. Somewhat small, it has panels of 15 representative Karsh portraits on three of its four walls.

Two tiny cubicles house Mrs. Joyce Large, his executive secretary, and Lois Muir, her assistant.

Occasionally, natives of Ottawa, affording no honor to one of their own, wander in to ask Karsh to develop snapshot film.

A stairway at the fourth wall leads to the studio proper. Except for screens, a table, a chair and two view cameras, the studio is bare. The larger of his two cameras is ivory-colored. He dislikes black cameras. He feels that they depress his subjects. For the same reason, his focusing cloth is crimson, lined with gold. His second camera is silvered.

How He Takes a Portrait

At work, Karsh sits his subject, arranges his lights and carries on a disarming patter of conversation. Dredging up astonishingly intimate bits of information about his subject that may have occurred as the merest fragment of an earlier conversation is part of his act.

"You like Drambuie," he says. "It has a piquancy." Then: "You hold your hands like this. It's part of you. Will you do that now?" Or, "You tilt your head when you listen. Try it." Or, "I want that animation in your face that you showed yesterday when we were discussing your faith."

It's things like that that bring the exclamation, "This picture is a wonderful likeness." It has to be. It's natural.

Now he loads his camera. Ostensibly he relaxes so his subject will relax.

"Did you know," he says, "that you really have to be a Presbyterian to be a successful publisher? Beaverbrook and Henry Luce and DeWitt Wallace are Presbyterians—"

Click! As his subject responds with a face lighted by an interest in what he says, he takes the picture.

Insists on His Own Way

Most always, he seats his subject uncomfortably.

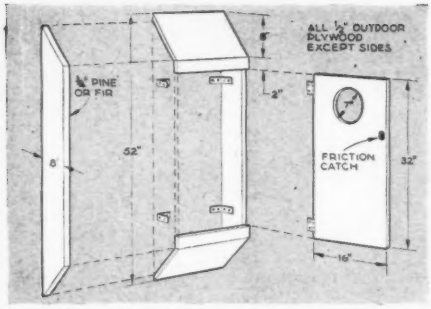
"A person who is comfortable is not interesting," he says.

He is chary of taking too many pictures.

"If you can't get a personality in the first 12 shots, the spontaneity is lost."

He is gently insistent on having his own way. A famous, aging actor asked him not to

[Continued on page 256]



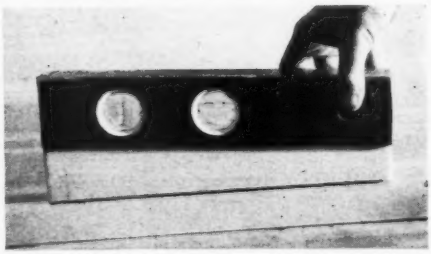
Meter Is Neater in a Box

THE electric meter and its fuse box, crawling up the side of a house, are not exactly scenic assets, but they can be nicely concealed with an enclosure like this. You may have to alter the dimensions to suit the size of your meter and fuse box.—*Hi Sibley, Nuevo, Calif.*

Grease Threads to Stop Rust

KEEP the threads on adjustable basement posts well covered with cup grease. The grease will prevent rust and permit easier adjustment of the posts when needed.—*H. Leeper, Canton, Ohio.*

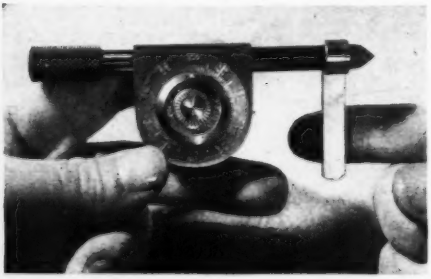
Level Adapted to Suit Pitch



IF YOU have a job that calls for a particular slope, you will save time by adapting a level for the slope. Taper one edge of a block to match the pitch. Then screw the level to the other edge of the block (above). Among the uses I've found for this dodge are laying drain tile, installing pipes, repairing a roof and building concrete forms. —*Darrell Huff, Sonoma, Calif.*

R.P.M. Counter Keeps Score

A TACHOMETER of the type used with a watch will also serve as a counter, to tally the number of persons or cars, say, that pass a given point. Bend one end of a narrow strip of metal into a loop that will be a push fit on the shaft of the counter (below). To use, flip the strip around once for each unit.—*Ken Murray, Colon, Mich.*



Bolt or Screw Serves as File

LACKING a round file for working on wood, plastic or soft metal, you often can substitute a bolt or large wood screw. To make it easy on your fingers, turn the first few threads of the bolt or screw into a wooden handle.

PERSISTENT IN PERFECTION . . .

Your goal is a perfect job. Only the best of materials, the most careful workmanship, and the finest of tools are good enough for you. And you are quick to recognize the work of other real mechanics who, like yourself, are persistent in perfection.

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BONNEY TOOLS

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This 3-Bedroom Ranch-Type House can be Yours for as Low as

$8,995 to $9,995*

(DEPENDING ON LOCAL COST VARIATIONS)

This new 3-bedroom National Home . . . the Saratoga Design, is the most outstanding home buy in America today. For beauty . . . livability . . . economy . . . durability and dollar-for-dollar value, no other home offers you so much for so little!

Look! Compare! Buy and Save!

*This home is built complete, ready for occupancy, on an insulated concrete floor. Cost of lot is not included. Wood floors with or without basement may be had at slight additional cost. National Homes are available in many different designs in 2-, 3-, and 4-bedroom sizes and may be had with porches, breezeways and garages.

Send 25c to Department PS1, National Homes Corporation, Lafayette, Indiana, for a copy of Your National Home Magazine, for complete information.

COMMENDED BY THE CONSUMER SERVICE BUREAU OF PARENTS' MAGAZINE

"National Homes prefabricated panels and structural parts are commended by Parents' Magazine as advertised therein."

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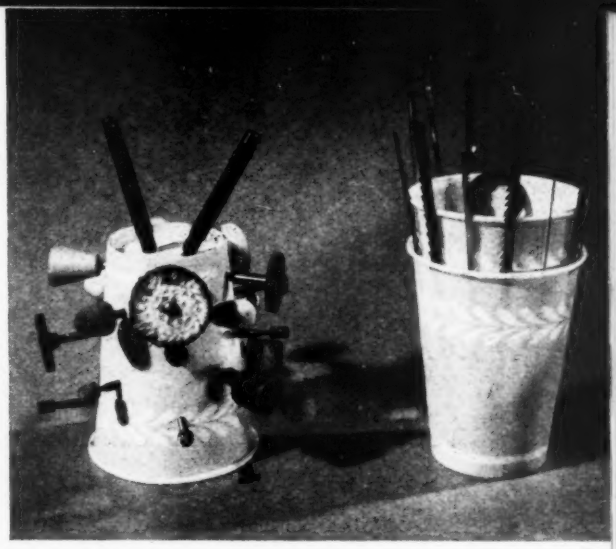
National HOMES

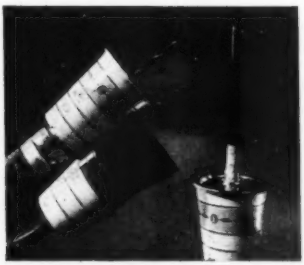
NATIONAL HOMES CORPORATION
LAFAYETTE, IND. • HORSEHEADS, N. Y.

TOOL HOLDER. Holes in one cup at right hold hand-grinder accessories. Cup inside another keeps jigsaw blades. Inner cup holds chuck wrench.



TOOL COOLER. For grinding without burning tool edges, make a hardboard or plywood holder with a hole for a water cup, and slot other end for a bolt.

GLUE GUN. Snip off tip of conical cup and use it as glue gun by rolling lip around pencil. Conical cup with tip cut off also makes funnel.



CATCHALLS. When doing overhead work, cups will catch drill chips and paint drips. Lid for glue cup can be made from disk of Mason-jar lid.

There's a Place for

Paper Cups in Your Shop

Low-cost cups are naturals for dozens of time- and work-saving shop jobs.

PUT paper cups to work in your shop. They are disposable and cheap. Unlike cans, they don't rust and unlike bottles, there is no cleaning bother.

They can be held to many surfaces by thumbtacks or they can be dropped into holes cut in thin wood or cardboard so you can carry them as kits. Besides holding small odds and ends, you can use the unwaxed type for mixing paints and the waxed ones for mixing glue.—*Kenneth Murray, Colon, Mich.*

FLOCK GUN. Blow into the inlet to expel flock from upper tube. Rolled and glued paper makes the tubes. You have to hold the lid down when you blow.

SPUN GLASS (above) and wool felt are installed like calking—forced into openings around windows with edge of putty knife.

HAIR FELT is tacked to window frame so it presses against sash snugly but loosely enough to permit sash to be raised and lowered.

ZINC-AND-FELT type has felt backed by notched zinc strip. It can be bent to fit in corners. The zinc strip has holes for brads.

How's the time to Weatherstrip

Cut your fuel bill this winter by stopping heat leaks with weatherstripping. You can apply most types yourself.

SUPPOSE a wall of your home had a hole in it big enough to put your head through. You'd certainly waste no time in repairing it. Yet unless your home is weatherstripped, you already have the equivalent of such a heat leak.

Add up all the crack areas around windows and doors and that's about what they'll equal. A crack little more than 1/32" wide all around one large window is equivalent in area to a hole as big as your fist. And many loose-fitting windows and doors have cracks wider than 1/32".

Storm windows are, of course, important —a must in many parts of the country. However, every window and door in your house should *also* be sealed with weatherstripping. A good weatherstrip job can reduce your heat loss by as much as 20 percent—even without storm windows.

There are many types of weatherstripping available at hardware stores or lumberyards. They can be separated into three basic groups, according to the service which they are designed to give. First, there are those intended for use only one year. Next there are semipermanent types, which last for some years under normal conditions. The third group, more costly to install, includes weatherstripping that is permanent.

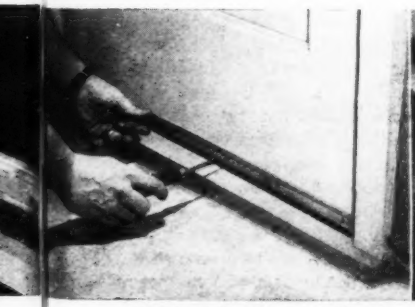
Temporary types. These include the familiar hair-felt weatherstrip, one of the cheapest kinds. The felt should not be used on a window that will be raised frequently.

This material can also be used around entrances, though it does not stand up well on a frequently used door. It is installed in the same way as around a window. Just nail it to the door-stop molding so the door closes snugly against it.

Other types in this group include wool felt and spun glass. They are forced into cracks or seams like calking. Wool felt comes in rolls like hair felt, but generally is used to calk around loose-fitting windows which will not be opened until spring.

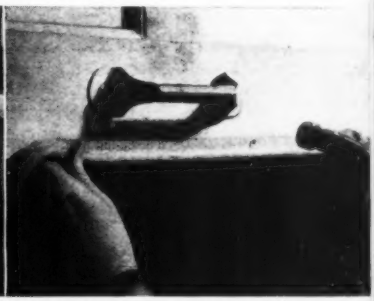
Spun glass—called Frost King Fiberglas[1] —is used to fill cracks in the same way. It is rot-proof and fireproof, and it expands after installation to form a tight seal. Use a dull putty knife, a wide-bladed screwdriver, or even the back of a table knife to tuck the spun glass in place. Both spun glass and wool felt are also used to keep loose-fitting windows and doors from rattling. Both of these are only temporary

1. Thermwell Products Co., 1261 Broadway, NYC.



DOOR BOTTOM is a rigid strip of brass and felt or zinc and felt that is screwed or nailed to bottom of door on the side toward which it opens.

WOOD-FELT type is bradded around windows and doors like molding. Corners should be mitered. This type can be painted to match trim.



SPONGE-RUBBER GASKET, like that around refrigerator doors, is tacked on cellar doors and windows and on garage door as shown above.

and must be removed the next time that the window or door is to be opened.

Semipermanent types. Zinc-stiffened felt comes in rolls with its own tacks and is suitable for almost all weatherstripping jobs. To install this around a door, tack it to the door-stop molding so that the felt presses snugly against the closed door. For a good fit, install this weatherstrip with the door closed. It is also best to install it all in one piece.

Start at the bottom of one side, work to the top, then across and down the other side. Drive the tacks into the holes in the zinc, making sure to put one into each hole.

A special type is made for the bottom of the door. Called door bottom, it is a wider, rigid strip, and comes in lengths of 32″, 36″ and 42″. A bottom should generally be installed on the side of the door toward which it opens. Measure and snip the bottom to the length needed, less about ¼″. The felt should just touch the saddle when the door is closed.

Zinc-felt strip is fitted around a window in the same manner as hair felt. First tack it to the frame around the inside so that it bears against the sash, yet permits easy sliding. For the top sash it is generally better to tack it around the exterior of the window frame. If the weatherstrip were tacked around the inside of the top sash there would not be clearance between the two sash when the lower one was raised.

After tacking the weatherstrip in place around both the upper and lower sash, seal the crack between the top of the lower sash and the bottom of the upper sash when the window is closed. First tack a piece to the top of the bottom rail on the upper sash. The felt edge should be just about even with the inside edge of the upper sash. Then nail another piece to the top of the rail of the lower sash. The felt edge should touch the edge of the first piece when the window is closed.

In addition to zinc and felt there is also a rigid wood-and-felt stripping. It comes in 7′ lengths and in various widths, from ½″ to 1½″ wide. The narrow ones are for windows, and the wider ones for doors and door bottoms. Since it can be painted, wood-and-felt stripping is less conspicuous than the zinc type. It costs a bit more than metal and is a little more work to install.

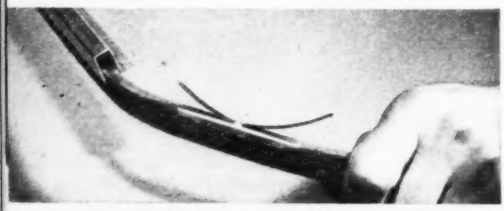
Another semipermanent weatherstrip is the sponge-rubber gasket. This is a welting of plastic-covered sponge-rubber with about ½″ of plastic on one side to give you a tacking surface.

This weatherstrip was developed for sealing car and refrigerator doors and was found to be so efficient and durable that it has gradually crept into use in homes. It is especially useful around cellar windows where grit and sand soon make the usual felt weatherstrip ineffective.

Another new weatherstrip, for metal casement windows, is a very thin, self-adhering, wool felt called Feltseal[2], that comes in 50′ and 100′ rolls. It has a pressure sensitive adhesive on the back, and all you do is press it firmly right on the jamb, so that the edge of the window will close against it. Be sure that the metal is clean and dry. Start at the top and work your way down the side of the frame. When you reach the bottom use a razor blade or sharp knife to cut it off square. Then continue around the other sides,

Another new stripping—Flexseal[3]—is de-

SELF-ADHERING WOOL FELT is particularly suitable for metal casement windows. It comes in a roll and is simply pressed on window jamb.



STEEL SPRINGS force the felt strip of Flexseal into contact with door or sash. Felt has been pulled out of channel to show springs.

2. *Thermwell Products Co., 1261 Broadway, NYC.*
3. *U.S. Weatherstrip, Inc., 24 W. Broadway, Salt Lake City 1.*

SPRING BRONZE, a friction weatherstrip that doesn't show when both sash are closed, is installed in four steps: 1, in the channels in which the lower and upper sash ride (strips should be ½″ longer than the sash is high); 2, on bottom edge of lower sash; 3, on top of upper sash; and 4, on inside edge of the lower rail of the upper sash. In first three steps, edge of spring bronze that has nail holes is faced toward inside of house.

signed to be nailed around windows and doors and consists of a strip of felt that rides on steel springs in an aluminum channel. The springs, pushing between the back of the channel and the felt, keep the felt strip in contact with the door or window.

Permanent types. Grooved weatherstrip is either a metal strip or track on the window casing which slides in a groove in the sash. In the case of a door it consists of two interlocking metal strips—one in the door casing, and one rabbeted into the door. With this goes a special metal weatherstrip saddle which locks with a strip on the bottom of the door.

These interlocking or sliding metal weatherstrips are efficient and permanent, but they are no job for the amateur to tackle, requiring special tools for a smooth installation.

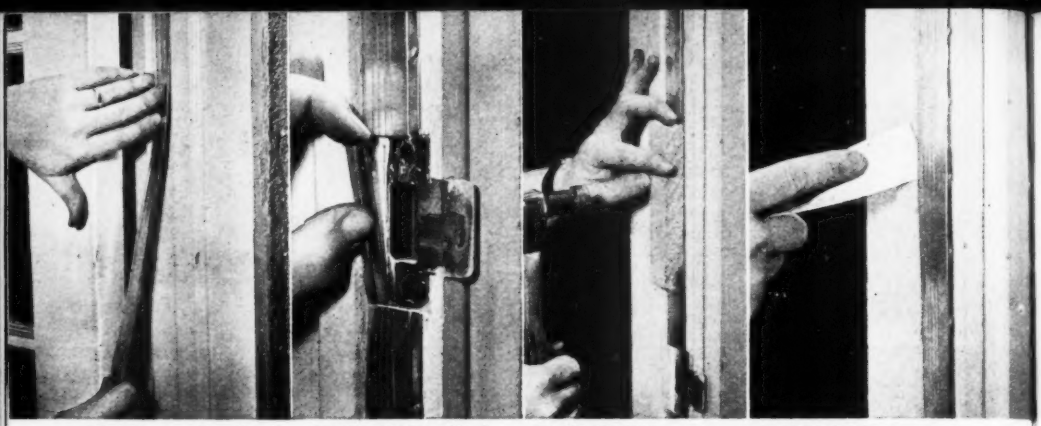
Spring bronze is almost as good as the grooved type and can be installed by almost anyone. It is a permanent type of installation like the interlocking kind and requires nothing more than a pair of snips, a ruler and a hammer. It is available in 100′ rolls, and also in sets of precut lengths.

Start by cutting pieces for the sides of the sash. Slip the strips into the exposed window channel, leaving 1/16″ between the bottom end of the strip and the window sill. Then start nailing at the top with the rustproof nails provided, driving them into the holes in the strip. Position the strips in the channels so that the unnailed edge almost, but not quite, touches the divider between the window channels when the strip is pressed flat.

Drive nails into every other hole first, pressing the strip flat as you go. Then double back and drive nails into the remaining holes. This system prevents any buckling or warping of the bronze.

The piece for the inside edge of the lower rail of the upper sash should be ½″ shorter than the width of the window. Fasten this with the nailed edge toward the top. Now close both halves of the window. This piece should just rub against the outside face of the lower half when the window is completely closed. If it doesn't, spring the grooved edge out slightly.

The installation of spring bronze around a door is equally simple. First cut side



DOORS can be fitted with spring bronze. Strips are nailed to jamb on sides and at top of door with springy edge toward door-stop molding.

STRIKE PLATE calls for careful fitting. Cut piece of spring bronze to fit between edge of strike plate and door-stop molding.

TIGHT-FITTING spring bronze can be loosened by tapping block held against it. If stripping is too tight, door or window is hard to open.

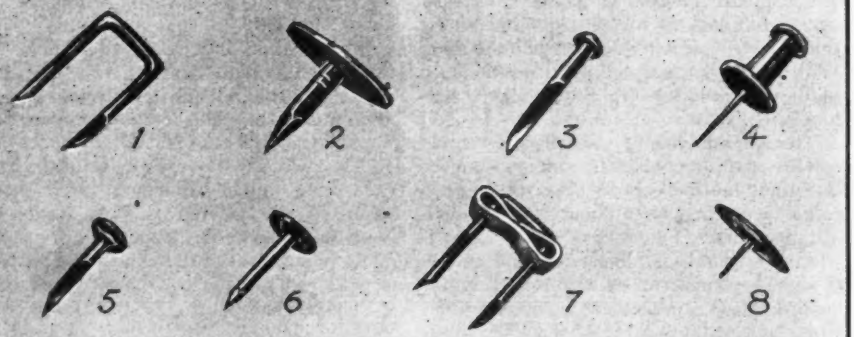
LOOSE-FITTING spring bronze can be made to fit by springing up unnailed edge with knife. Loose stripping lets air leak in and wastes heat.

pieces ½″ shorter than the height of the door. Nail these in place against the door jamb. Put the nailed edge toward the direction in which the door opens, with the grooved edge near the door-stop molding. Work from the top down, and follow the same system of nailing as you did on the windows. Position the bronze strip so that when the strip is pressed flat, as it would be when the door is closed, the unnailed edge will be as close as possible to the door stop without actually touching it. After fitting both of the sides, put a piece across the top of the door jamb. For the bottom of the door, use a zinc-and-felt door bottom.—*Bernard Gladstone.*

CIGAR-BOX QUIZ

Dig into the cigar box and try to identify these tacks. Invert the page to score yourself.

By C. B. Colby

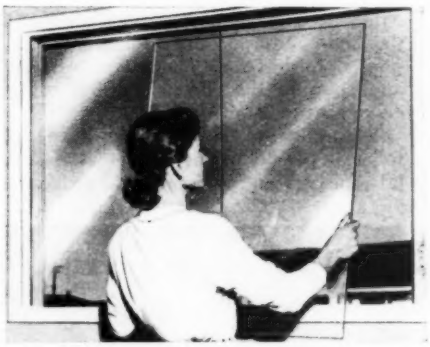


1. Double-pointed; 2. bill poster's; 3. upholsterer's gimp; 4. drafting; 5. upholsterer's; 6. wire upholsterer's; 7. insulated; 8. thumb.

New for the Handy Man

1. Liquid Sets Level Fast. Foundation building and other construction work is simplified with this level. It consists of a 50′ transparent plastic tube that is filled with a red liquid. Above, the tool is shown being used to level a parking lot. Clamps that come with the level are fixed to uprights (inset). The liquid at both ends of the tube then gives a perfectly level line. By measuring from the ground to the liquid level in the glass, the degree of slope can be determined very quickly.

2. Junior Snake Cleans Drains. A brush on the end of a 42″ flexible shaft clears clogged drains when you crank the wheel. As the drain begins to open, the shaft is pushed in farther. Pulling the shaft back and forth while cranking insures a thorough cleaning. The maker says it will open drains that are clogged by paper, hair, matches, hairpins and other small articles.

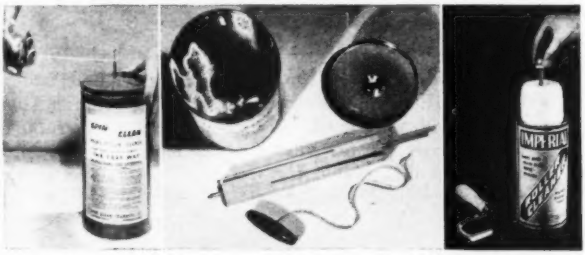


3. Window Has No Sash or Putty. Only one piece of hardware is used with this window—a pull latch that locks the window closed or partly open. The unit consists of precut redwood pieces that are nailed between studs to form a frame. Then the panes, which slide in grooves in the frame, are inserted. The unit comes, without glass, in 23 sizes.

Please turn the page for more handy-man aids

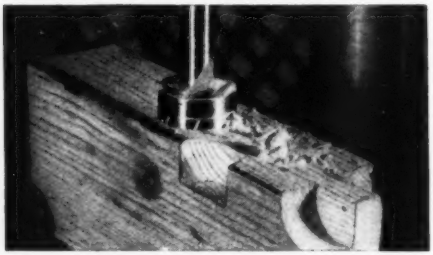
New for the Handy Man

4. Adhesive and Tape Join Carpeting. Flat, almost invisible seams are now possible when this fabric-and-paper tape and a rubber-base adhesive are used to join carpeting. Tacking and sewing are eliminated. Needle-like metal grips in the tape help hold the two pieces of carpeting together. First step (left above) is to lay tape and apply adhesive. Then the first piece of carpet is pressed on tape and adhesive applied to edge of carpet to seal in the pile. Final step (right above) is to press the second piece of carpet down on tape and against the edge of first piece. The carpet can be walked on within an hour. Tape and adhesive are to be available soon.



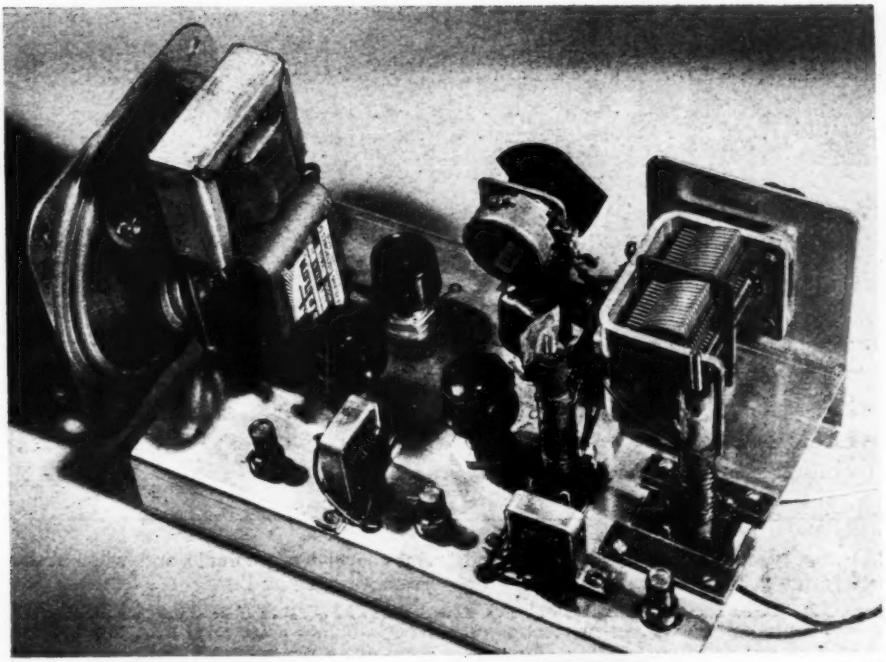
5. Cans Clean Paint Rollers. Paint rollers are easy to clean with either of these two cans. Spin Clean (at left and center in photos at right) uses the old Yo-Yo principle. The roller is slipped on the spindle and put in the can. Then the cord is wound around the shaft. After each pull, the cord rewinds on the shaft. After excess paint is spun off the roller, the paint is poured out of the can and solvent poured in the can. The roller is replaced and spun in the solvent until it is clean enough to be stored.

With Roller Cleaner (far right), the roller is placed in the can of solvent, the lid replaced, and the can shaken vigorously for 30 seconds. After cleaning a roller, the solvent is allowed to stand until the paint settles to the bottom. The solvent then is poured off and the paint sediment cleaned from the bottom of the can. The solvent can be used again. If the roller with its axle won't fit in the can, the axle can be removed from the roller.

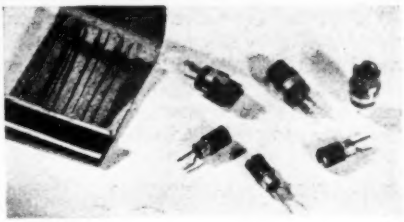


6. Two-Part Bit Drills Arcs. This bit is said to drill wood of any grain structure and at any angle without splitting it. Even arcs of a circle can be cut without tearing the wood. The ring and the cutter it encloses are both detachable so that they can be sharpened separately on a grinding wheel. A cone-shaped wheel is used to sharpen the ring and a standard wheel for the cutter.

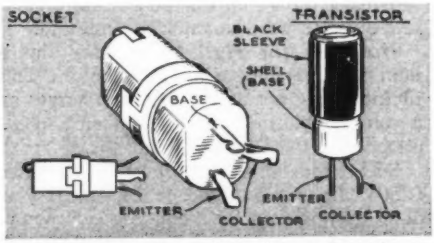
1. Levelall Co., 81 Webster St., Rockland, Mass.; 2. Home Necessities, Inc., 1129 S. Queen Anne Pl., Los Angeles 19; 3. Ernest Pierson Co., Eureka, Calif.; 4. United States Rubber Co., 254 Fourth Ave., NYC; 5. Spin Clean Products Co., 979 N. 39th St., Milwaukee 8, and Wilson-Imperial Co., 115 Chestnut St., Newark, N. J.; 6. PTI, Inc., 401 Broadway, NYC.



PREVIEW OF SETS TO COME, this tubeless receiver gives good headphone reception with three transistors and even works a speaker on local stations. Comparison of matchbook with transistors (in foreground, right) shows size. Sockets are behind.



Now You Can Build a Transistor Radio



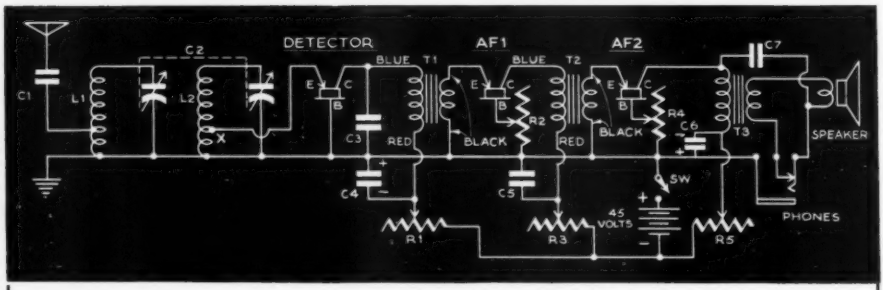
DRILL HOLES for the sockets, insert them from beneath, and bend tabs over on top to hold them. Base lug is aligned with a looped clip that grips the transistor. Scratch the letters B, C and E on bottom of socket as wiring aid.

Miracle crystals that need no A battery and last for years do the work of vacuum tubes in this experimental receiver.

By Howard G. McEntee

ANY experimenter's blood must tingle to the challenge of transistors—those tiny germanium gimmicks that make like vacuum tubes. They have so many advantages that they are sure to replace tubes in hundreds of applications (see page 134). Pint-size television sets and wrist-watch radios are likely to come when transistors take over.

But you needn't wait. You can buy at

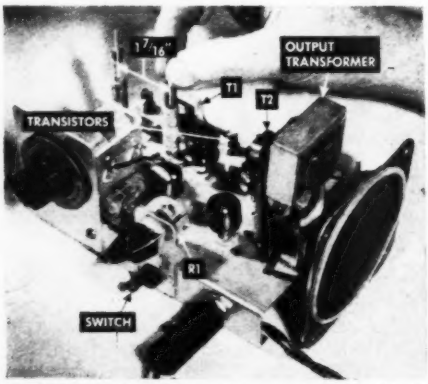


LIST OF PARTS

C1: .001-mfd. mica
C2: two-gang tuning, 365 mmf. per section
C3: .01-mfd. mica
C4, C6: 5-mfd., 100-volt midget electrolytic
C5, C7: .1-mfd. midget paper
R1: 250,000-ohm potentiometer
R2, R4: 500-ohm variable resistor
R3, R5: 10,000-ohm variable resistor
L1, L2: Antenna coils (Miller A-121-A)
T1, T2: Midget plate-to-line transformers (UTC SO-3)
T3: Output transformer (Thordarson 24S54)
3" midget PM speaker (optional)
Transistors (Western Electric A-1698) 3 req.
Transistor sockets (Cinch 34AZ17431) 3 req.
Closed-circuit phone jack
SPST toggle switch
Chassis, 1" by 4" by 6" (ICA 29085)
B Battery, 45 volts

least one type of transistor right now and build a radio that will work a speaker on strong stations. In the process you'll learn a lot about the latest thing in electronics.

Where to get them. Still costly compared to vacuum tubes, the cheapest transistors available will cost you about $6.50 each from the Western Electric Co. at Allentown, Pa. These are point-contact transistors, not the latest junction type, and are made for computer and telephone circuits.



DISCARD COIL CASES and mount one coil adjustably on the chassis. The spacing shown gave best results; closer coupling produced double-hump tuning. As tuning condenser had no trimmers, the two circuits were aligned by moving coil slugs as shown, the screws in them being insulated with tape. Once aligned, slugs were held in sleeves with cellulose tape.

But they'll work a radio and will last for years if not abused.

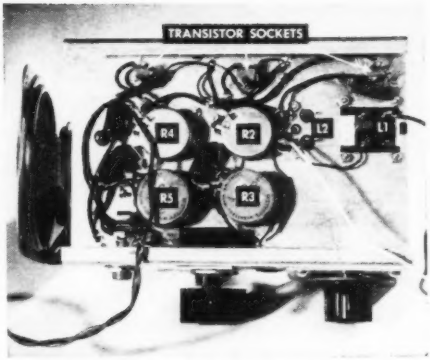
Still in the development stage, transistors have a higher noise level than tubes, draw more plate current (although no filament juice), and are far from uniform. Some work better as detectors, others as amplifiers. You take pot luck when you buy, but that's the price of experimenting—and part of the fun.

What's performance like? Although it won't replace your living-room superhet, this three-transistor set is fine for listening after others are asleep, or for keeping Junior occupied—and quiet—when he wakes up ahead of the rest of the family.

Headphone volume is all you could want, and reception is dependable. Speaker volume is modest, suitable only for quiet locations. Because of the high noise level (heard as a hiss), the set must have a strong signal. It requires a good antenna and ground.

Building the rig. An ordinary aluminum chassis is the backbone of the set. The tuning condenser and R1 (which serves as a volume control) are mounted on a plate attached to the front of the chassis.

Sockets for transistors are made by the Cinch Mfg. Corp., Chicago 24, Ill. If you don't want to wait for them, you can mount one end of an ordinary automobile-fuse clip to hold each transistor and bend tiny clips of spring brass to grip the prongs. *Don't solder leads directly to the prongs.* The heat will ruin the crystal.



UNDER-CHASSIS VIEW shows sliding mount for first coil (L1) and the four adjustable resistors. Once set, these will require no further adjustment unless transistors are changed.

Mount the interstage transformers at right angles as usual. Those shown are midget plate-to-line units, mounted with aluminum strips. But ordinary 3-to-1 audio transformers will do as well. If you care to dispense with the speaker, you can save the price of the output transformer, too. Use high-impedance magnetic earphones for best reception.

Two tuning coils give excellent selectivity. If you are in a fringe area, you may not need that much, and can use a single coil, hooking the antenna to the tap marked X in the drawing.

Watch your polarity. That positive ground shown in the diagram is no mistake. Be sure you ground the plus side of the power supply. If you follow tube practice and ground the negative, you'll be out of business to the tune of three ruined transistors. For this reason a polarized battery plug is a good idea.

The interstage transformers are also hooked up backwards from what they would be in a tube circuit. The low-impedance winding goes to the emitter (which in this circuit acts like a grid) and the high-impedance side to the collector (or plate equivalent).

The electrolytic condensers C4 and C6 must as usual be installed with due respect to polarity. If they have metal cases, these will be negative, so insulate them from the positive chassis with a wrapping of cellulose tape.

Checking transistors. If you have a zero-to-10 milliammeter, connect it in series with the battery to try out the set. With R2 and R4 at zero resistance, and R1, R3 and R5 about midway, put only the second AF transistor in. Turn R5 slowly toward zero until the meter reads two milliamps and leave it there.

Then insert the first AF transistor and finally the detector, adjusting R3 and R1 in turn to give a total of 4 and 6 ma. respectively.

Lacking a milliammeter, you can listen with the earphones as you adjust the resistors. A loud click and a sharp reduction in hiss indicate the point at which plate current shoots up. Back off the resistors below this point, for no signal will pass above it.

With all transistors in, you should hear a loud hiss. Hold the antenna temporarily at X on coil L2 to tune in a station. Then transfer the antenna to C1 and move the core of L1 or L2, or adjust the trimmers if the tuning condenser has them, until the signal comes through at maximum strength.

Finally, adjust the five resistors to give maximum volume. Once set, the chassis-mounted ones won't have to be changed unless you shift transistors around.

Try them all ways. Be sure to try each transistor in each of the three positions. Some work much better as a detector than others. Some seem to oscillate strongly, and R1 may be turned to a point at which the collector current suddenly jumps. Just before this the signal gets much louder, as in regenerative circuits.

If you use a speaker, be sure to mount it on a baffle. A square foot of corrugated cardboard with a 3″ hole in the center adds surprisingly to the volume.

Since even distant lightning may induce enough current in an aerial to burn out the transistors, it's a good idea to disconnect the set when you are not listening. END

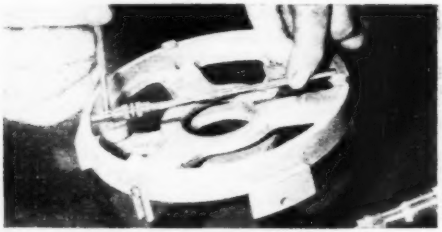
Workshop Wisdom

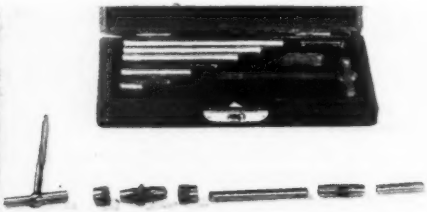
On his circular saw Dan McCrumb
Meant to cut a cleat square and quite plumb.
But guess what the hitch is
That left him in stitches . . .
He backed up the kerf with his thumb.

Foot Feeds Cutting Oil. A salvaged auto fuel pump and some angle brackets will feed cutting lubricant to your lathe or drill press. This foot-powered rig spouts juice only at the time you want it, leaving the work clear when you want to see what's going on.

Bolt the pump to two husky brackets on a wooden baseboard. Mount a third bracket at right angles so that the pedal lever can be pivoted on it and will press up the diaphragm linkage from beneath. (On the pump shown, the linkage is exposed by removing a cover plate.) Add a short spring to pull back the lever originally worked by the engine camshaft.

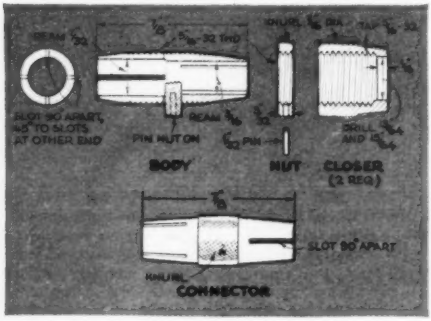
The intake hose is dropped in a can of cutting fluid set on the floor. For drilling, a cheap hollow-handled glue brush makes a good applicator. Just slip the delivery hose on the handle.—*Floyd McGuckin, Ridgewood, N.J.*





Rods Mike Big Diameters. One telescoping gauge with a ¾″ to 1¼″ range, plus homemade extension rods and a 2″ micrometer, will give precision measurements to 6″ and check taper and out-of-round in holes up to that size.

The set shown consists of seven rods ½″ to 3½″ long, in ½″ steps. Cut them slightly over length from 3/16″ drill rod, and turn a small radius on each end. Lap to length with an oilstone, removing the rod from the lathe often to check length with a large micrometer or vernier calipers. If you start with the longest, any lapped undersize can be salvaged for the next smaller.

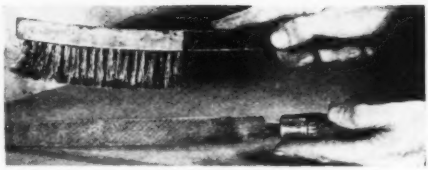


Thread the coupling body full length first. Drill and ream the two bores, turn the end tapers, and cut off. Cut four slots from each end within 1/16″ of the center, offsetting those at one end 45° from those at the other.

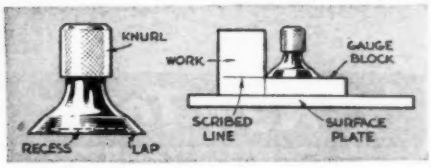
Drill the closers tapping size not quite through; then drill clearance size for the rod or gauge leg. Run a 5/16″-32 bottoming tap within 1/16″ of the end. Knurl and taper if desired, and cut off.

The connector is simply reamed 3/16″ and slotted for spring tension in the same way as the coupling. As the photo shows, the coupling connects one rod to the gauge, and the connector adds a second rod if necessary.

Hold the assembly as in the photo at left above when you take a reading.

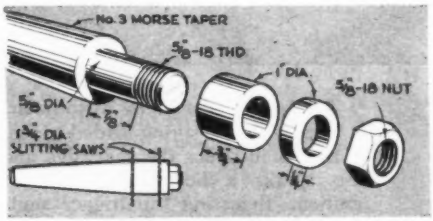


Brush Blows Clean Files. Lead and other soft material hard to remove from file teeth will usually surrender if you use a wire brush like a hammer. Rest the file on a solid support. Swing the brush so that the wire bristles strike the file at an angle of about 45° and approximately in line with the cut of the teeth. A minute or so of this usually cures the most stubborn case of clogging.—*Walter E. Burton, Akron.*



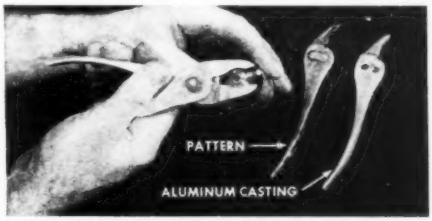
Self-Renewing Scriber. A scriber you'll never find dull is easily turned from drill rod. Knurl the knob for easy handling; then face and recess. After hardening, lap the bottom on an oilstone or with compound.

The drawing shows how the scriber is used with gauge blocks to scribe dimension lines from one face of the work. Since the entire circumference scribes, a turn renews the edge.—*A. R. Morgan, Naugatuck, Conn.*



Dual Saws Speed Slotting. This arbor holds two slotting saws at once and saves setup time. Just push it into the spindle and you can cut slots of two sizes. Two such arbors, with saws .020″, .030″, .040″ and .050″ thick permanently mounted on them, will do almost any slitting job that turns up. With a suitable collar, two precisely spaced cuts can be made at once.

Turn the shoulder a close fit for saws, and be sure all collar faces are square so that the saws run without wobble. Use the thinner saw on the outside.



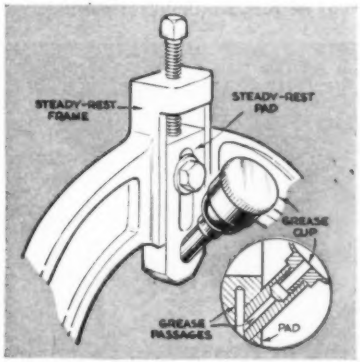
Pliers for Knurled Nuts. Sometimes a stubborn knurled part must be turned with pliers. Copper slip-on jaws are commonly used on pliers to prevent marring, but aluminum pliers are surer and make a nice addition to your tool rack.

Take apart a pair of ordinary pliers and fill the hole or slot in one leg with wood putty. Use this leg as a pattern to cast two of aluminum. Since the usual slip-joint slot would wear fast in such soft metal, drill two holes in one leg instead. For the wide-jaw setting, switch the pivot bolt.

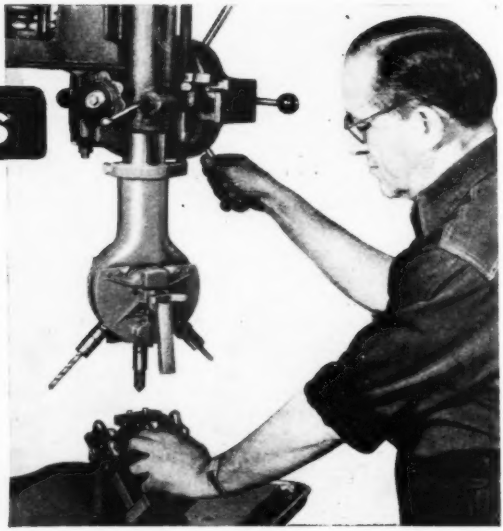
Steady-Rest Lube System. Intent on a lathe job, you can easily forget to oil work in the steady rest—until it overheats and scores. To solve that, put a grease cup on the upper pad of each steady rest.

A hole is drilled in the pad to make a force fit for a short steel rod. The rod is tapped for a standard grease cup and drilled through. A second grease passage is drilled up from the work-bearing end of the pad. Cut at an angle, the rod is driven to this passage.

Grease melts and flows faster than oil if the work heats up, and so compensates for any oversight.—*Clifford T. Bower, London.*



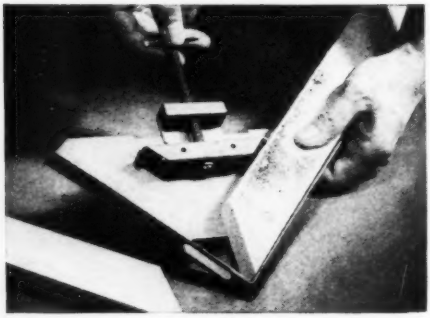
New Tools



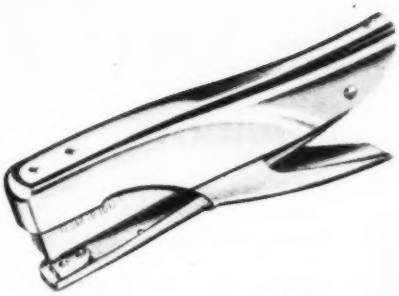
1 Turret Head for Drill Press. Drilling, reaming and tapping or sequence drilling can be done rapidly on a single drill press when this three-spindle turret head is used. It is indexed with a handle in front that can be turned without stopping the motor. An adjustable torque-control clutch on one spindle protects taps, and speed can be varied at each spindle to suit the tool being used. Capacity of all spindles is ⅜″.

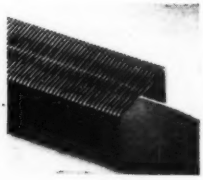
2 Acetylene Torch Is Automatic. Squeezing the spring-loaded trigger of this torch opens the gas valve and also sparks a heavy-duty flint for ignition. Releasing the trigger shuts off the flame. For a continuous flame, the trigger can be locked open. The torch is said to be especially suited for on-and-off work such as in many plumbing, heating and refrigeration jobs, and for loosening nuts and bolts, removing paint or heating tile mastic.

3 Clamp Holds Miters for Joining. Miter and butt joints can be held securely for joining with this 7″ by 7″ corner clamp. It also will serve as a glue clamp for setting mortise and tenon joints. Made of steel, it takes stock up to 2½″ wide. The sides, top and bottom are open for nailing.

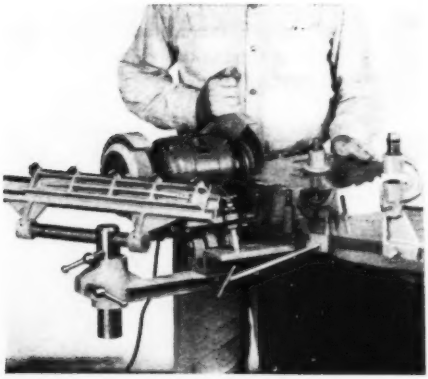


4 Screwdriver Set. These six magnetized screwdrivers range in size from a ⅛″ by 2½″ blade to a ⅜″ by 8″ blade and carry an unconditional guarantee for replacement of any of them that are broken in use. The plastic handles are shatterproof. The set is priced at $2.49.

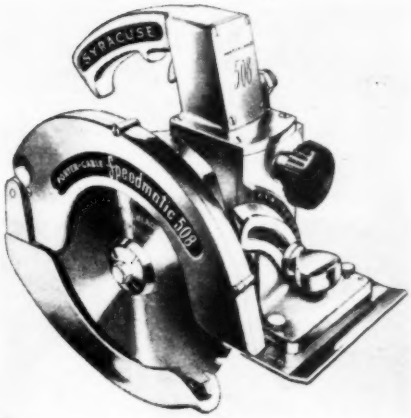




5 Nicked Staples Easy to Extract. To remove one of these new staples, you bend it and it snaps at the nick in the center. The halves then come out easily. The staples were designed especially for use on fabric, but can be used as conventional fasteners. The stapling gun swings open for use as a tacker.

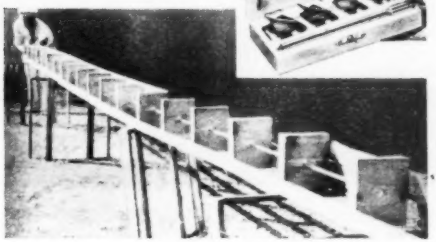


6 Tool Sharpens and Sets. Planer and jointer knives, plane irons, circular-saw blades and wood chisels can be sharpened with the Sharp-Smith. It takes saw blades from 4″ to 48″ and planer and jointer knives up to 24″ in length. It has positive setting action to grind each tooth or blade uniformly.



7 Saw Has Kickproof Clutch. The friction clutch in this saw lets the motor turn even though the blade binds in the cut. It comes in two models—with a 7½″ blade and a 2½″ depth of cut and an 8″ blade, 2¾″ depth of cut. Both operate at 4,500 r.p.m. under load. Weights are 15 lb. and 17 lb. respectively.

8 Long-Distance Drill. Holes from ⅜″ to 1″ can be bored through 27′ of studding or joists or through 56″ of solid wood with this boring set. Extensions of 6″ or 12″ lengths can be added without removing the bit from the work. The set includes four bits —⅜″, ¾″, ⅞″ and 1″. The points of the bits have a front rake which, it is said, requires from half to a third less power. According to the maker, a ¼″ drill will operate the tool. Because of the rake, the bits also can be used to power-drill low-melting-point plastics.



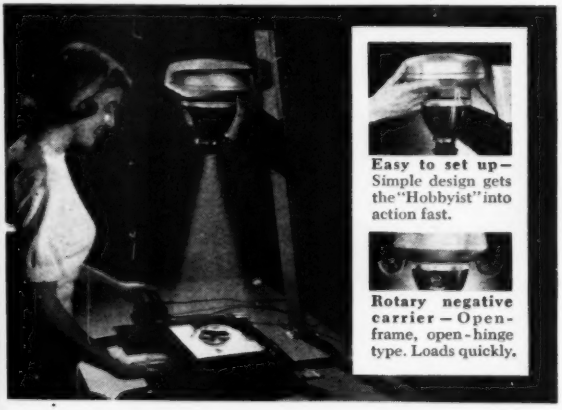
Further information on these products can be obtained from: 1. Commander Mfg. Co., 4225 W. Kinzie St., Chicago 24; 2. Velocity Power Tool Co., 7505 Thomas Blvd., Pittsburgh 8; 3. Eagle Products, Box 844, Meriden, Conn.; 4. Terry Products, Box 581, Merrick, N.Y.; 5. Speed Products Co., 32-01 Queens Blvd., Long Island City 1, N.Y.; 6. Belsaw Machinery Co., 315 Westport Rd., Kansas City 2, Mo.; 7. Porter-Cable Machine Co., Syracuse 8, N.Y.; 8. Time Saver Tools, Inc., Mundelein, Ill.

Developing, Printing, Enlarging ...a fascinating hobby

So easy to begin, too—and inexpensive

DID YOU KNOW that Kodak offers a complete printing kit for only $4.95 (see opposite page)—that for this small amount you can have the thrill of making prints from your own negatives? Taking the picture is really only half the fun. Developing and printing can double your enjoyment from photography. And for less than $50 you can acquire a fine enlarger that will let you select the ideal portion of your picture ... eliminate unwanted areas ... make the final print even more than what you hoped for when you clicked your camera shutter.

On these pages you see just a few examples of a wide choice of equipment now on display at your Kodak dealer's. He will be glad to start you off right and help to keep you within your budget.

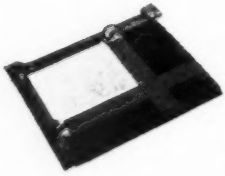


Easy to set up—Simple design gets the "Hobbyist" into action fast.

Rotary negative carrier—Open-frame, open-hinge type. Loads quickly.

Complete enlarger — less than $50. The Kodak Hobbyist Enlarger uses cold-light illumination—perfect protection for negatives. Only reflected light reaches negatives. Integrating-sphere lamphouse, together with specially created interior reflective coating, results in even light distribution. Newly designed negative carrier loads easily. Knobs are provided for locking both elevation and focus. Enlarges up to 7 times. Kodak Enlarging Ektanon Lens, 89mm., *f*/6.3, helps produce crisp, sharp enlargements. For negatives through 2¼" x 3¼". $44.

Fine, versatile enlarger—the Kodak "Flurolite"—$99.50 (without lens). Advanced design ... integrating-sphere light source for even illumination ... easy-loading rotary negative carrier. Focusing and elevating knobs may be used at the same time. With accessories, the 2¼" x 3¼" "Flurolite" quickly converts for copying and many other uses.

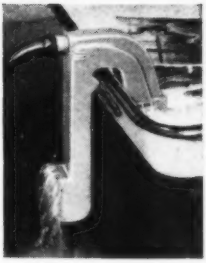


Eliminate unwanted areas in enlargements—Select ideal portions with the help of Kodak Masking Easel, 11 x 14. For use with any vertical enlarger. Can be adjusted for ¼- to ¾-inch margins. $9.60.

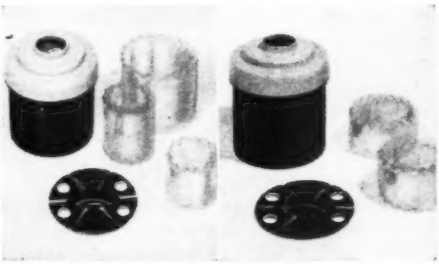
Everything you need for printing—Kodacraft Printing Kit contains rocker-type trays, printing frame, paper, graduate, Kodak Tri-Chem Pack, thermometer, stirring rod. $4.95.

For developing and printing – Kodacraft Photo-Lab Outfit includes printing frame with masks for popular negative sizes, Kodacraft Roll-Film Tank, other essentials. $8.75.

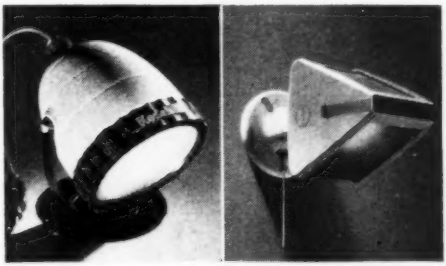
Includes metal printer – Kodacraft Advanced Photo-Lab offers complete developing and printing equipment. Everything can be packed in printer for handy storage. $14.10.



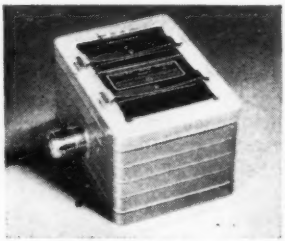
Converts ordinary tray into effective washer—Kodak Automatic Tray Siphon. Washes prints and films automatically. Hypo-laden water is siphoned out as fresh water enters. $4.50.



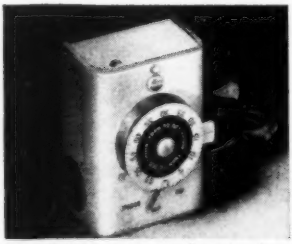
Kodacraft Roll-Film Tank *(left)* is easy to load, pour; holds 16 oz. of solution. After loading, it can be used in lighted room. Includes aprons for 620-120, 616-116, and 127 films. $2.53. **Kodacraft Miniature Roll-Film Tank** *(right)* permits simultaneous development of two rolls of 35 mm. film or Bantam-size film (828). $2.53.



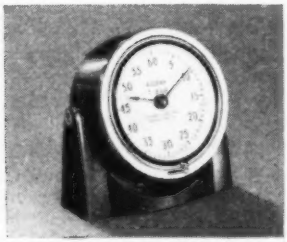
A Safelight that adjusts quickly—Kodak Adjustable Safelight Lamp *(left)* has double-swiveled shank and bracket. $7.40. **The new Kodak 2-Way Safelamp** *(right)* provides either direct or indirect illumination—or both. For light in two directions, simply take out removable metal panel in back and replace with a safelight filter. $4.50.



Kodacraft Metal Printer, Model A—accepts negatives from 35mm. up to 4 x 6 inches. Metal construction with hinged platen. An easy-to-follow folder of instructions is supplied. $6.95.



For timing contact and projection printing – Kodak Electric Time Control. The printer or enlarger plugs into the control. Automatic timing 1 to 57 seconds. Repeat timing possible. $13.50.



Spring-wound Kodak Timer—covers all intervals up to 60 minutes, has both minute and split-second hands. Tilting base permits adjustment to any angle. $7.20.

Your Kodak dealer will be glad to demonstrate this equipment for you. Make his store your headquarters for all your photo needs.

Prices subject to change without notice

EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.

Kodak

TRADE-MARK

Gus Gets the Pitch

[*Continued from page 198*]

started the engine. As the tow truck eased back out of the way it revealed a state police car also parked crosswise of the entrance.

Sgt. Jerry Corcoran was standing in front of it with his right hand resting firmly on the butt of his gun.

"Okay, you fellows," ordered Jerry, "might as well make it easy for all of us. Slide out of the car with your hands in back of your heads."

Gus Gives Stan the Inside Dope

At that moment, two more state cops appeared from behind the tow truck and had handcuffs on the startled pair before they knew what was happening.

"Thanks a million, Gus," said Jerry, after he'd herded the handcuffed pair into their own car with a trooper at the wheel and another in the back seat. Then he climbed into the police car and started the engine.

"What gives with the carnival guys?" asked Stan as he and Gus watched the two-car caravan pull away. "Fleece a local yokel at the last stand?"

"Nothing as simple as that," said Gus. "That car of theirs has more built-in secret compartments than a Chinese puzzle chest."

"Jewel smugglers?"

"Dope peddlers."

"Then they weren't really carnival men at all."

Pitchmen Put Up a Good Front

"Sure they were. They've been using that as a front to sell dope to local peddlers around the country. That car of theirs is a rolling narcotics warehouse."

"Gosh, how did you spot it?"

"Well, if the trouble hadn't been in the ignition I probably wouldn't have stumbled on it. In checking it over on the first go-around, it seemed as if everything was oversize—the battery, the oil cleaner, even the coil. Incidentally, the trouble was in the distributor."

"What was it?"

"You know that small carbon brush in the center terminal of the distributor cap that serves as the contact for the spring on top of the rotor?"

Stan nodded.

"Well, it had cracked and a piece of it had dropped down into the breaker-arm assembly. It was shorting out the breaker arm, and keeping the breaker points from closing, too."

"What was suspicious about that?"

"Nothing. But after I dislodged the piece and began replacing the broken brush with a new one, the coil caught my eye. I noticed that it seemed higher than most. I twisted the top and it came off in my hands. The outer shell was a very neat dummy. Inside was a standard coil and wedged in around it were dozens of tiny white paper packets."

"And that's when you decided to road-test the car," put in Stan.

Gus Helps Smash a Syndicate

"Right. I wanted Jerry and the boys at the barracks to back me up. The paper packets contained dope, all right—'uncut heroin' they said—and a concealed drawer at the back end of the battery case was filled with marijuana. What the narcotics boys'll find when they really go to work on it is anybody's guess."

"Nice haul for Jerry," said Stan.

"Oh, both the state and the federal boys knew that some syndicate was doing a fast job of distributing dope around the country, but they didn't know about this car. Now they think there might be more than one, part of a big network run by some mechanically minded guy who thought up this gimmick of stashing the dope away in car parts rather than under the seats and in built-in compartments cops are wise to."

Sometimes It Pays to Play Dumb

"But wouldn't any wise mechanic like you catch on?"

"They probably have their own garage where they go for repairs, most likely the same place where the changes are made. Fortunately, the mechanic, whoever he is, cracked that distributor brush." Gus grinned. "And maybe you noticed I played kind of dumb."

"You sure did. Maybe you ought to be in show business yourself." END

Next month: Gus goes hunting for trouble.

Tipsy Tip

A GUY went into a bar and ordered three buckets of beer for his horse, hitched outside. Bartender says, "All that beer for the horse? How about you?" "Not me," says the guy, "I'm driving." —*Clues.*

"Does 5 KINDS OF JOBS Well!"

Buy a plier that's sure to be "the HIT of Your Kit"

The SARGENT PARALLEL-ACTION PLIER!

(The Mechanical Hand)

What a plier! Actually *three* tools in *one* . . . plier, wrench, and wire cutter.

You'll quickly discover this Sargent to be the most useful tool you've ever had for jobs around the house.

Look what it does:

1. Grips like a vise

. . . compound leverage multiplies power along entire length of the parallel jaws.

2. Cuts wire easily

. . . outside cutters cut wire even when it tightly hugs a flat surface.

3. Holds nuts like a wrench

. . . powerful parallel jaws and extra leverage prevent rounding corners.

4. Gets into tight spots

. . . and gets you out of them. Small nose permits probing in close quarters.

5. Unkinks wire

. . . open throat permits running the wire between jaws, from either end, to straighten or pull it.

SARGENT of New Haven ®

Go to your hardware dealer . . get your hands on one of these sturdy, all-purpose tools. You'll never let it go . . . especially when you hear its price. You'll be delighted with your low-cost investment in a high-grade plier. Available in 4½", 5½", 6½" and 8" lengths.

For further details, write Dept. 26 K!

Sargent and Company, New York • **NEW HAVEN, CONN.** • Chicago

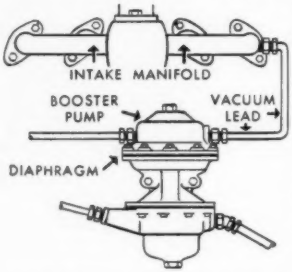
Builders Hardware and Fine Tools since 1864

Care and Feeding of Engines

BY S. P. CORP

THE CASE OF THE SLOW WINDSHIELD WIPER

Most cars have a windshield wiper booster pump mounted on the fuel pump. Any time your wiper operates at less than 80 strokes per minute, check this booster pump for trouble—because such trouble can affect engine operation.



For example, an air leak in the vacuum line (see arrows) will cause a lean mixture at the end of the intake manifold, making the engine miss when idling. Such a leak, if neglected, will cause sluggishness in the valves of the end cylinder, eventually burning the valve seats.

Remove vacuum line at intake manifold. Plug the hole in the manifold and run the engine. If engine idles smoothly (when it missed before) the trouble is in booster pump or vacuum line. If there is any trace of oil in the line, your booster pump needs a new diaphragm—because a cracked or damaged diaphragm has been causing oil waste. The oil you see has been sucked up from the crankcase and delivered to the intake manifold, to be burned with fuel.

If your windshield wiper seems slow, at any engine speed, check the booster pump!

TEST SHOCK ABSORBERS

Shock absorber trouble can cause hard steering, pitching on turns, and hard riding. Check each corner by trying to bounce the car, holding the end of a bumper. If it bounces several times before coming to rest, the shock absorbers need attention. To remove, take off upper and lower holding nuts from rubber bushing on studs. Lock lower end of absorber in a vise, and pump up and down full length of travel. If it sticks at any point, or is hard to pull, it should be replaced. If there is no resistance, valves are leaky and it should be replaced. Normally, there should be more resistance in extending than in compressing.

NEW FREE BOOK ON CAR CARE

Send for your free copy of the new illustrated booklet, "MORE POWER, Less Oil, Less Gas" which tells you how to keep your car running better. It also tells you all about Sealed Power KromeX Ring Sets, engineered especially to fight heat, friction, abrasion, and corrosion in late-model cars and trucks. Sealed Power Corporation, Dept. H-10, Muskegon, Michigan.

Week-End Railroad

[Continued from page 166]

were laid on ballast of cinders or crushed limestone. The road now has more than half a mile of main line with equal trackage in sidings, industrial spurs and yards.

Most of the rolling stock has been built from scratch. Even the trucks for the freight cars were built at the shop of a machinist member, from WF&P patterns and castings.

Crowds Forced Passenger Service

The small fry around St. Louis soon heard about the road. Nowadays 200 to 300 passengers are carried on a Sunday. Each one gets a printed ticket, properly punched by the conductor, and everybody obeys the rules. No tickets are sold, but a contribution box is handy for those who wish to pay. Rigid safety rules prevent accidents.

Bug-eyed youngsters bitten by railroad zeal beg to be taken on as crew members, and those who qualify are given the high privilege of working up to trainmen and conductors. The WF&P weeds out the true railroaders through the simple process of putting the beginners at track work.

Over the years the emigration of members has built up a class of alumni scattered about the country, so that the WF&P now has "general agents" stationed at San Luis Obispo, Calif., Amory, Miss., Evanston, Ill., Baton Rouge, La., Green Bay, Wis., and Mexico City. Some of the alumni commute to St. Louis several times a year to keep their hands in. Currently the most remote member is an airman in Korea.

The president, Joseph L. Christen, is an official of the Pullman Co. at Chicago. Others active in the management include two research chemists, a machinist, two engineers, an embroidery manufacturer, a travel agent and a college instructor.

The WF&P intends to go right on expanding and meeting all schedules every Sunday. All it asks of the public is that nobody refer to it as cute. END

Milk Express

WHEN the 4:15 local from Squeedunk suddenly stopped in the middle of its run, the conductor reassured the passengers: "Just a cow on the tracks."

A few miles farther on, the train squealed to a halt again. Explained the harassed conductor, "We caught up with that cow again."

For preparing new surfaces

smoothing seams and joints

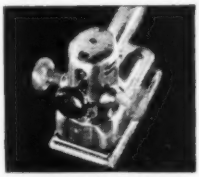
refinishing furniture

removing old paint

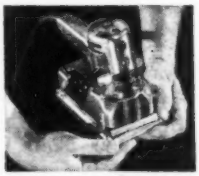
4 EXCLUSIVE FEATURES

KING-SIZE BOTTOM PLATE extends beyond body of tool for sanding in very close quarters.

MODERN SWITCH HANDLE is located close to housing for better control, less operator fatigue.



AUXILIARY KNOB HANDLE gives choice of three positions for ease in sanding close to obstructions.



UNIQUE PAPER HOLDER stays open when attaching or detaching paper, frees both hands for job.

NEW Black & Decker Utility No. 44 SANDER only $46.95

- **"Satin-Smooth" Finish,** *every* time, in *any* direction, because tool produces small 3/16" orbit 4250 times per minute!
- **Ten Times Faster** than hand sanding on wood, metal, plastics, compositions!
- **Light Weight,** only 5½ lbs., easy to use . . . helps even beginner do professional jobs!

Black & Decker

ELECTRIC UTILITY TOOLS

PORTABLE ELECTRIC TOOLS

Bob Davis says:

"Take it from a guy who cut his eyeteeth on tools, this new B&D Utility No. 44 Sander is a top buy! It's smooth-running, gives a finish like satin and it's priced below tools of comparable quality! Just attach a 3⅔" x 9" sheet of abrasive paper; plug it in any electric outlet (A.C. or D.C.); and you're ready for the finest finish sanding — no final hand sanding needed! When you want a real tool, *not* a mere toy, pick the *brand the experts choose* . . . BLACK & DECKER!"

WRITE FOR *FREE* BOOK! Packed with helpful, money-saving hints on home jobs!

Send to: Home Service Dept. H10S, THE BLACK & DECKER MFG. CO., Towson 4, Md.

Name .....

Address .....

City & State .....

Good starting trio

Starting a home workshop—for hobby-crafting, household fix-ups, or developing your skill as a professional mechanic? Here are three basic files you really need. Smart move for a good initial assortment of file types and cuts!

1. **MILL FILE** – For smooth-finishing metal and tool sharpening. Popular lengths, 8" and 10".
2. **SLIM TAPER** – Slender triangular file for saw sharpening and general filing in corners of 60° angle and wider. Popular lengths, 6" and 7".
3. **FOUR-IN-HAND File-Rasp** – Four different cutting surfaces! One side flat, other side half round. Half of each side file cut, other half rasp cut. For flat or curved surfaces of wood, brass, lead, etc. Popular length, 8".

Don't consider anything less than Nicholson or Black Diamond brand—the world's finest file quality. *At good hardware stores.*

FREE 48-page illustrated book, "*File Filosophy,*" on kinds, use and care of files. Write for it.

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(In Canada, Port Hope, Ont.)

BLACK DIAMOND TRADE MARK

NICHOLSON FILES *FOR EVERY PURPOSE*

How to Choose Your Trees

[*Continued from page 170*]

whole idea of growing fruit trees at home.

Among flowering trees, the experts' favorite is the Crab Apple, with nine varieties suggested. Says a middle-western horticulturist: "There is practically an unlimited selection of flowers, fruits and leaves."

Chief rival of the Crabs among flowering trees is dogwood, a popular favorite since George Washington's time. Some experts consider it the best native ornamental tree in the northern United States. Not only does dogwood have beautiful flowers, but also handsome summer leaves, berries and red foliage in the fall. "Fit for a palace or a rural setting" is the way one New England horticulturist describes it.

In the South the traditional evergreen Southern Magnolia is highly thought of not only for its flowers, but also for shade, screening, windbreak and its general appearance on the grounds. It's even recommended for planting along the seashore.

Pecans Lead the Nut Parade

Pecans lead all the nut trees by a big margin. The fastest growing of the hickories, the pecan not only has thin-shelled nuts, but makes a fine shade tree where it's hardy. Its only rival among the nut trees is the giant Black Walnut—the tree Grandma's commode was made out of—but the Black Walnut is pretty big to have near a house. And it has to be kept away from other trees since its roots give off a poisonous substance that kills many other kinds of plants if they get too close.

A favorite shade tree with nurserymen—and one that looks like a comer—is the Sweet Gum. It has fine fall color. A comparatively new tree for home use is the Thornless Honey Locust, being actively pushed as a replacement for the disease-ridden elm. This tree not only stands up well under city conditions, but grass flourishes under it. The shade that it casts is just dense enough to keep the hot summer sun from burning the sod.

The experts scattered their shots widely in suggesting trees to avoid, but some names showed up repeatedly. Most of them are fast-growing trees that lack the strength of their slower fellows, and are weak-branched, or easily uprooted, or short-lived, or susceptible to blights and insects.

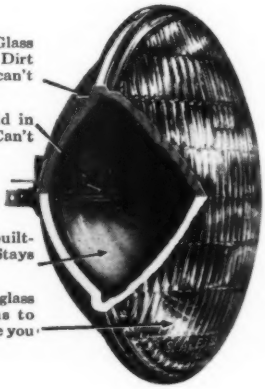
The poplars lead the unpopularity con-

[*Continued on page 252*]

There is a difference in sealed-beam headlamps

...and this is it →

All-Glass sealed-beam headlamps do not grow dim



WHEN YOU BLOW ON YOUR GLASSES, moisture condenses on the lens. When moist air gets inside some types of sealed-beam headlamps, the same thing happens. It condenses on lens and reflector. And as the water deteriorates the reflector, the lamp grows dimmer.

Moisture *can't* get into General Electric sealed-beam headlamps because they're All-Glass and all one big bulb. Tests show they average 99% as much light after years of use as when new. To drive and enjoy it—knowing you can see safely—get General Electric All-Glass headlamps.

You can put your confidence in—

GENERAL ELECTRIC

How to Choose Your Trees

[Continued from page 250]

test for these reasons, even though nurserymen sometimes recommend them for screens and windbreaks because of their quick growth—as much as 21 feet in two years.

But the poplars have some friends on the Great Plains, where they are among the few trees that will endure drought and wind. Another is the Box Elder, which is also avoided by horticulturists in other sections because of its weak structure and poor appearance. It also brings a host of brightly colored little bugs that swarm up the nearest house to lay their eggs inside.

Trees for the City

Some trees are useful only where conditions are so bad that other trees do not survive. The Catalpa will grow in the heart of cities, for example, but it's a weed tree elsewhere. So is the rugged Tree of Heaven, which spreads at the drop of a seed pod, but has vile-smelling flowers. The Ginkgo, most nearly disease-resistant of all our common trees, and able to endure city conditions, is unpopular with some because its fruit has an unpleasant smell when crushed.

The seashore, with sandy soil and flying spray, presents its own problems. Live Oaks are the favorite in the South. Willows and birches are often mentioned elsewhere. The common kinds of pine, like the Jack Pine, are also suitable for seashore planting.

The experts all emphasize that it's pretty hard to pick the best *single* tree for any use. Even when you narrow down to trees suited to your own property with its special climate and soil, you'll still have a choice to make—and your answer will depend on your personal likes and dislikes.

So use the chart as a general guide to start you finding the tree you want among the 3,000 available. But when you come to your final choices, consult people who are familiar with your neighborhood.—*Hartley E. Howe.*

Lucky Guy

Wife: "I've made my husband a millionaire."
Friend: "What was he before you married him?"
Wife: "A multimillionaire."

SAVE YOUR CAR—IT MAY HAVE TO LAST A LONG TIME

Mechanics agree that most engine wear occurs because oil drains into the crankcase during stops. This gives acids a chance to attack unprotected metal and is the cause of DRY STARTING which wears out engines . . . leads to costly repairs.

To prevent "Engine Ulcers," use Miracle Power in gas and oil. Miracle Power contains colloidal synthetic graphite in suspension. This graphite clings to metal . . . holds oil . . . lubricates parts even if oil is absent . . . protects them against DRY STARTING and acid etching. And you save gas and oil because better lubricated parts waste less power.

Try Miracle Power next time you get gas.

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At gas stations, garages, Kaiser-Frazer, Ford and other car dealers or use this coupon for introductory offer.

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Enclosed find $_____ for which please send me *postpaid:*
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☐ Please send me free literature on making my car last longer.
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©AP Parts Corp. 1952

"Company pays $1200 for cost-cutting idea!" "Employee wins $350 for suggestion!" Ever wonder how *you* can cash in on *your* company's suggestion system? Check these Bostitch case histories. There may be an idea here for *you* — and *your* company.

BUSINESS: Cabinetmaker

SUGGESTION: Fasten bottoms and sides of small chests with Bostitch foot-powered stapling machine and ⅜" staples.

RESULTS: Five times faster than old method of nailing. Stapling more secure. Workers like it better.

BUSINESS: Gasoline Pump Manufacturer

SUGGESTION: Instead of solder, use ⅜" staples to fasten No. 8 mesh on foot valve bottom of pump.

RESULTS: Production jumped from 20 an hour by soldering to 90 an hour with Bostitch.

BUSINESS: Tile Contractor

SUGGESTION: Instead of nailing metal lath to wood studs and joists, use Bostitch hammers and tackers.

RESULTS: One man can now lath 4 bathrooms in 2½ hours compared to 5 hours the old way.

BUSINESS: Garage Door Manufacturer

SUGGESTION: Metal stitch aluminum panels together with Bostitch wire stitcher. Old method: drill and screw.

RESULTS: Plant turns out 500 doors a day as against 50 before. Stitcher and special table jigs for positioning panels save space, material.

BUSINESS: Vacuum Cleaner Manufacturer

SUGGESTION: To fasten metal discs inside fiber cylinders, use Bostitch metal stitcher instead of punching holes and riveting.

RESULTS: Manufacturer saved $6250 the first year.

BUSINESS: Frozen Food Locker

SUGGESTION: Replace cellophane tape with Bostitch desk-type stapler for fastening ends of frozen food packages.

RESULTS: Labor and material costs cut 50%. Bostitch method gives tight, permanent seal. Unlike tape, will not loosen at low temperatures.

TO HELP YOU find ways to apply Bostitch savings to *your* business, send for the 16-page illustrated booklet, "Time and Money-Saving Case Histories." It's *free*—and full of cost-cutting ideas!

BOSTITCH®
AND FASTER
fastens it better with wire

BOSTITCH *530 Mechanic Street, Westerly, R. I.*

Please send me a free copy of the Bostitch book of case histories.

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FRICTION THIMBLE* MICROMETERS

Give You

- UNIFORM PRESSURE
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Every Time

Starrett Satin Chrome Micrometer No. 231-F Range 0-1" by .0001", shown above. Friction Thimbles also available in other sizes and styles.

*An improved friction stop mechanism built right into the thimble permits easy, one-hand operation — insures uniform contact pressure for every measurement. You get the same sure accuracy every time . . . plus 12 other big Starrett features including Satin Chrome Finish, Tapered Frame, Hardened Threads ground from the solid and stabilized and Hi-Micro Mirror-Lapped Finish on contact faces. See it at your Starrett Tool Distributor's.

SEND FOR IT — ONLY 10¢
Starrett "Tools and Rules" Book
shows the right tools for any measuring job. 50 pages, 100 pictures, helpful reference tables. Address Dept. PS

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MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

Crane That Saves $2,000 a Minute

[*Continued from page 147*]

For a minute he looked right through me.

"I've only seen it happen once," he said at last, "and that was a long time ago. We had a good crane engineer—all of them are. Generally they can sense the strain of a load, but that time there was no warning. The strands let go so fast he had only one chance. That was to flop on his face and wait for the cable to stop lashing around the cab. The wrecker was a shambles when the drum finally stopped spinning. But by some miracle he was never even touched.

"No, we don't worry too much about the cables. But there is always the chance of a load shifting, or coming free sooner than you expect. That's why we seldom depend on those ice-tong-like clamps you see hanging from the ends of the car. We may anchor them to the rails to lift the light stuff, but when we have a tough assignment, we count 100 percent on the outriggers.

Wrecking Crew Skilled Unit

By now I was beginning to suspect that the judgment of a wrecking boss was worth as much as the half-million dollars spent on the machine. Tracy modestly denied it, but paid high tribute to his crew.

"I've got 12 men," he said. "Crane operators, cutting-torch experts and skilled car repairmen. They can put a railroad back in business faster than all the financial wizards on Wall Street. Some of them don't look like much when you see them working around the rip track or the Diesel engine house, which is where they draw their regular pay. But when the car-shop whistle gives with its four long blasts—that's our signal to go into action—they come running like a bunch of minutemen. Or two-thousand-dollar minutemen, you might say. They never beef when you ask them to do the impossible. All they ask for, in return, is good food when they are out on the road, and decent bunks when they can grab a bit of shut-eye. And, when they're not on duty—well, I never knew a crane operator yet whose hobby, believe it or not, wasn't fishing!" END

Things Are Tough All Over

Mr. Gotrocks: "I feel like a million dollars today."
Mrs. Gotrocks: "Why so depressed, dear?"

THE MOST *Versatile* TOOL ON YOUR BENCH!

CHANNELLOCK PLIERS

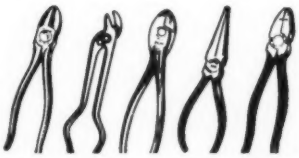
Made only by CHAMPION DEARMENT

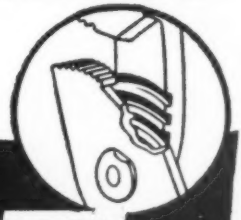
In almost any job you can think of—Pliers are necessary—and Channellock pliers are the best you can buy. Whether you are working on your car, electrical repairs, plumbing work or just tightening nuts and bolts Channellock pliers do it better.

And remember, Only Champion DeArment makes Channellock—More than 3/4 of a Century of experience in producing highest quality tools. Send for Catalog 14, —today.

CHAMPION DEARMENT TOOL CO.
Meadville, Pa.

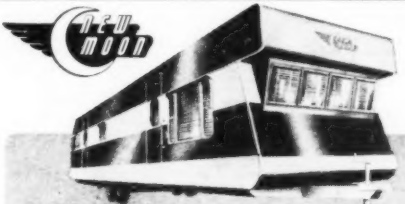
Channellock pliers are listed in the Yellow Pages of most Telephone Directories under "Tools"





ONLY Champion DeArment makes

CHAN NEL LOCK



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City _____ Zone _____ State _____

How Karsh Pictures Celebrities

[Continued from page 225]

include his hands, gnarled by arthritis, in his portrait.

"But they are part of your character, part of your greatness," urged Karsh. "Generations of theatergoers have delighted in the expressiveness of those hands. Let me try."

With his lights, Karsh put the hands in shadow. Even the actor conceded that the picture was a triumph.

He works for 10 minutes at a stretch, then gives his subject a rest. A sitting may require an hour. It may take all day. He refuses to commit himself to more than two sittings a day, and he prefers to work before noon. A subject scheduled for an afternoon sitting may have had a cocktail at lunch.

"It shows in the eyes," says Karsh.

He Does His Own Developing

Karsh appointments are hard to come by and, once obtained, are seldom broken. Jeannette McDonald did fail to keep a Karsh date in Hollywood—and hurriedly dispatched flowers to Madame Karsh in expiation of her sin.

Off the studio is the darkroom. Karsh does all his own developing. He develops by inspection—alternately dipping his film in the developer and holding it up to his safelight to mark his progress. He dislikes color film because developing it is purely mechanical.

When Karsh has done an outstanding picture, it becomes, in shop parlance, "The Churchill" or "The Sibelius" or "The Eisenhower." Such negatives are kept in a vault at a branch of the Bank of Nova Scotia.

In a little more than 10 years Karsh has photographed most of the famous men of the Western world. King George VI sat for him. So have Queen Elizabeth and her consort. All those pictures of the royal pair released for publication when they visited Canada and the United States last year as the Princess and the Duke of Edinburgh were by Karsh. Harry Truman, Bernard Baruch and even Vyacheslav Molotov have been Karsh subjects. Karsh has tried several times to make an appointment with Stalin.

"I once got as high as three commissars just under Stalin," he reports hopefully.

Karsh has even been reproduced on

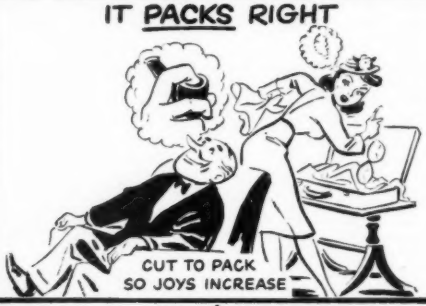
[Continued on page 258]

UNCLE WALTER

IT SMELLS GRAND

AROMA PROMISING SWEET RELEASE

IT PACKS RIGHT



CUT TO PACK
SO JOYS INCREASE

IT SMOKES SWEET

MAKES EVERY PIPE
A PIPE OF PEACE!

IT CAN'T BITE!

SIR WALTER RALEIGH'S BLEND OF CHOICE KENTUCKY BURLEYS IS EXTRA-AGED TO GUARD AGAINST TONGUE BITE. STAYS LIT TO THE LAST PUFF. AND NEVER LEAVES A SOGGY HEEL IN YOUR PIPE.

It costs no more to get the best!

TAKE LESS THAN 1 MINUTE TO

Keep Paint Brushes Like NEW!

Store Them Dry. They Stay Soft and Flexible READY FOR INSTANT USE!

PROCESS 33

INSTANT PAINT BRUSH CLEANER

- Quickly cleans fresh paint from a paint brush or roller.
- You can paint instantly with another color—or store brush dry—it will stay soft.
- Economical—can be used again and again.
- Safe for all brushes and rollers.

Pint 59¢ Quart 98¢ G. N. COUGHLAN CO. WEST ORANGE, N. J.

Wherever Paint is Sold

CHOOSE FROM PROFESSIONAL QUALITY

WESTCRAFT TOOLS

AT WESTERN AUTO

LESTO Electric HAND SAW

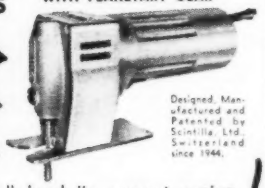
WITH PLANETARY GEAR

NO OTHER DOES

SO MUCH

SO FAST

SO WELL



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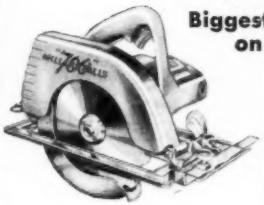
New Tools from Millers Falls

Most Versatile Power Tool You Can Buy

Sand, polish, drill, grind, wax, wire brush, mix paints — you can do them all with this powerful new 6-inch Millers Falls No. 966. And it's the only rotary sander-polisher that can be equipped with an orbital attachment for fine finishing.

A Rugged Husky for Tough Cutting

Razor sharp — with large, palm-fitting handle that lets you really bear down, this new No. 333 Utility Knife belongs in every tool kit. Unexcelled for heavy cutting in wood, linoleum, leather, cardboard, etc. Complete with 5 blades.



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Big enough to cut finished 2x4's at 45° mitre, yet weighing only 11 lbs., this new 7-inch Millers Falls No. 700 packs a full 1/2 h.p. wallop. It's sturdily built, compact, safe to use. Easy to handle and control—with all the capacity you need for practically any sawing job.

See these great new Millers Falls tools at your hardware dealer's soon. They'll save you time and work on countless jobs — and they're priced to give you top value for your dollar in every way.

Millers Falls Company, Greenfield, Mass.

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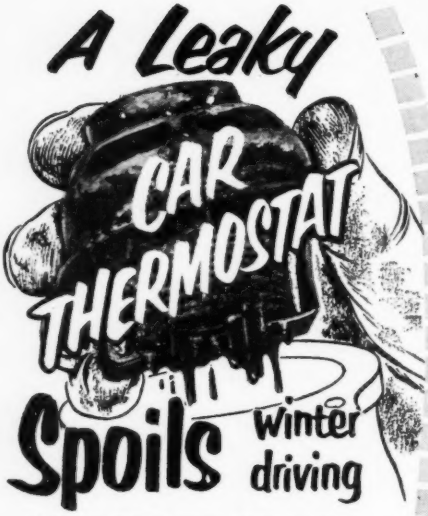
SINCE 1868 ®

The Mark of Superiority

A Leaky CAR THERMOSTAT Spoils winter driving



A heater cannot warm your car comfortably when a dirty, damaged or over-age thermostat prevents the engine from warming up properly. A faulty thermostat can also cause the engine to over-heat and boil away anti-freeze, wasting gas and oil.

Remedy this wasteful condition by getting your service man to check the motor thermostat. And if a new one is needed —

Replace with Autostat® motor thermostat by Fulton Sylphon

For faster starts and faster warm-ups, more miles per gallon, more comfort per mile. Save oil and reduce maintenance costs. Types to fit every make and model.

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How Karsh Pictures Celebrities

[*Continued from page 256*]

stamps. It was a Mackenzie King Karsh that appeared on a Canadian stamp and a Harlan Stone Karsh on a U. S. stamp.

"I have an insatiable appetite for giants," he has said.

What distinguishes a Karsh from other photographs is something that perhaps Karsh himself could not explain adequately. Critics mention only bits and pieces of his art. One said Karsh has an instinct for composition, but that doesn't adequately describe Karsh.

The Equipment He Uses

He uses the customary equipment—spotlights and floodlights, one 4″ by 5″ and one 8″ by 10″ view camera with Ektar lenses of different focal lengths, plus two reflex cameras, one loaded with color and one with black-and-white. Occasionally he uses a 35-millimeter camera when he wants to take pictures "discreetly." The reflex cameras are mostly for outdoor work such as the multiple portrait of a city—Vancouver, B. C.—on which he has recently worked.

For indoor portraits he uses a diaphragm opening of f/11 or f/16 and a shutter speed of about a tenth of a second. His film is Super XX.

For portraits of the face, Karsh is addicted to dark monochrome backgrounds. Now and then he will use a prop. An upthrusting of pencils appears unobtrusively in the lower-right-hand corner of a portrait of Henry Luce. He photographed Admiral William Leahy against a map, Charles Evans Hughes against a leaded glass window and Madame Chiang Kai-shek against an ornate Chinese screen.

That's as much as anyone knows about the Karsh technique. Now and then a little light is thrown on the gentle mystery of his thinking. In a telephone conversation he will remark: "I need some radar atmosphere. This man is a modest person, and I need to show his real stature."

Industrial Pictures, Too

Lately Karsh has branched out into industrial photography. He doesn't want to be typed as a portraitist. But, inevitably, because he is fascinated by the human countenance, his pictures of factory interiors have workmen's faces in the foreground. They are fine faces, reflecting the dignity of hu-

[*Continued on page 260*]

Piston Rings wear out, too

TOUGH..but oh so gentle !

TOUGH on oil-pumping
GENTLE on cylinder walls

And there's just one thing to do about worn-out piston rings —replace them! Fortunately, piston rings warn you when they begin to wear. You start using too much oil. Your engine begins losing power. The more you delay the more you'll pay.

Naturally you want the rings that are *tough* on oil-pumping, *gentle* on cylinder walls. You want the rings that will stretch out your engine's life. You want Hastings Piston Rings —the rings that are engineered exclusively for replacement service. They *stop* oil-pumping, *check* cylinder wear, *restore* engine performance—for a long, long time—and at surprisingly moderate cost. It's the best money you can spend on your car.

Play safe. Avoid a major overhaul later on. Go to your motor specialist and ask him for a piston ring check-up now.

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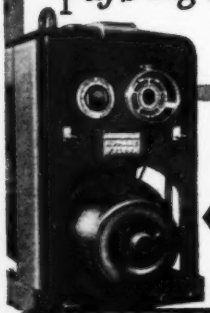
IN PACKAGED SETS FOR CARS, TRUCKS, BUSES AND TRACTORS

Arc Welding pays big with the new Hobart



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ADDRESS_____
CITY_____ STATE_____

How Karsh Pictures Celebrities

[*Continued from page 258*]

man labor. The pictures have a heroic, mural-like quality.

The Karshes are not wealthy. They chose not to be. Early in their marriage they sat down and posed themselves the question: Shall it be fame or fortune?

"By fame," Karsh explains, "we meant recognition for my work."

For several years, inflation notwithstanding, he has charged $350 for a portrait sitting, plus $25 for a master print. Subsequent prints cost $10 and up, depending on the work involved. Trips out of town are on a basis of the fee plus expenses. New York is not considered out of town.

Karsh could ask far more money, and get it. He won't bother. He and his wife have enough money to do with. That's all they want. In return, they have an independence that a straitjacket schedule, keyed to amassing money, could never give them.

He Just Says No

When Karsh wants to refuse a sitting, he simply says no. That's the end of it.

A lot of his earnings are dissipated in expenses. He dropped $20,000 on one safari to Europe, undertaken without assignment for the sheer pleasure of finding some more important faces to photograph. His prodigality, as befits the man, is not all for his own fun. Given a substantial honorarium for his appearance at Kent State College, he turned it back to establish a photographic scholarship.

Karsh has no regrets for the way Madame Karsh and he decided to arrange their lives together.

"So long as a man lives," says Karsh of Ottawa, "he can alibi his mistakes. When he is dead, only his work speaks for him." END

OOH! What You Said . . .

THEY have been having tests of atom bombs and such things in the patient state of Nevada, and the following story has come out of the area which is used to taking a chance.

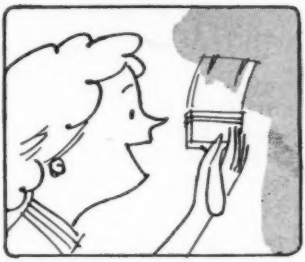
There was an Indian on one hill and an Indian on another hill and they were chatting to one another by means of smoke signals.

Pop went an atomic bomb, sending up its varicolored cloud blast into the bright desert sky.

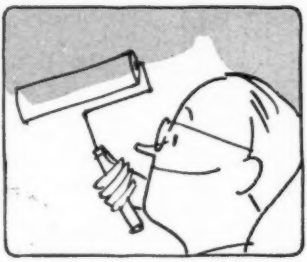
"Gad," one of the Indians exclaimed, "I wish I'd said that."—*Hy Sheridan in Flying.*

YOU CAN'T DO A BAD PAINT JOB

with New Gold Bond Velvet!



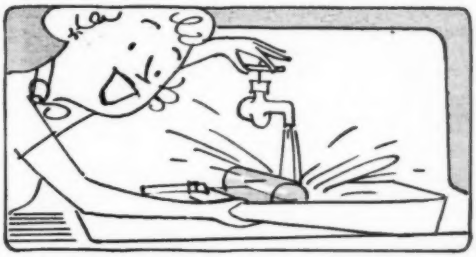
GOLD BOND VELVET is the easiest-going wall paint you ever used! Ready-to-use. No primer needed. Dries in minutes to a velvet smooth surface that won't crack, chip or peel.



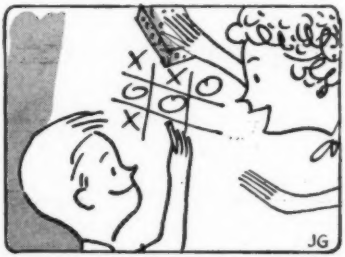
FLOWS ON! Just dip your roller or brush in odor-free Gold Bond Velvet and see how it goes on almost by itself! It eliminates what professional painters call "drag," which is so tiring.

WITH ORDINARY PAINT you have to guard against lap or brush marks, touch-up spots. No worry with Gold Bond Velvet! This latex-base paint blends perfectly . . . you can't do a bad job!

COVERS WALLS AND WOODWORK, TOO! Use Gold Bond Velvet over paint, plaster, wallboard and even over most wallpaper . . . without an undercoater.

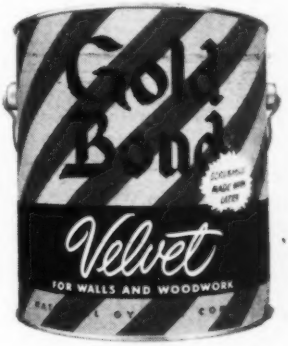


EASY TO CLEAN UP! Brush or roller cleans off with plain water. Spatter or splash marks clean up with a damp cloth. No turpentine needed.



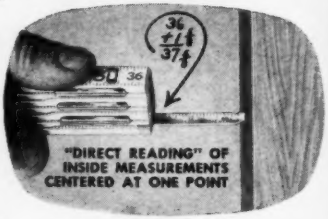
SCRUBABLE! Durable Velvet can be scrubbed year after year without harm. Pencil, crayon, finger marks and food smears wipe right off!

Ask your local Gold Bond paint dealer or lumber and building material dealer to show you the 12 new Velvet colors. The orange and tan label is your assurance of another top quality National Gypsum Company product.



NATIONAL GYPSUM COMPANY • BUFFALO 2, NEW YORK

Most versatile folding rule—

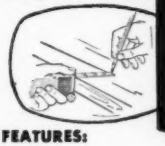


NEW STANLEY "100 PLUS" EXTENSION RULE No. X226

Make no mistake, the new Stanley "100 Plus" Extension Rule is the handiest, most versatile folding rule you can buy.

Read it four ways — on inside measurements using slide, entire reading is centered at one point — no chance for errors; may also be used as an ordinary extension rule for inside measurements, and as a regular folding rule reading from either end.

Use it as a marking gauge for measurements in 2" and 4" multiples.



CHECK THESE "100 PLUS" RULE FEATURES:

- Easy to read Big Black Numbers on White Sticks.
- Square ends — butt flush with work.
- Opens to even inches at end of each stick.
- Handy for end-to-end measurements — opens in 6" multiples to full length, 72".
- 8-inch Brass slide removable for use as depth gauge.
- New plastic finish wears four times longer.
- Extra Thick Rock Maple Sticks graduated all edges.

For real rule value ask for the X226 at your hardware dealer's. $2.65 each.

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Hardware • Tools • Electric Tools • Steel Strapping • Steel

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TOY PATTERNS—6 for 25c
Ideal gifts for the youngsters.
Two sets — 6 full-size patterns in each.

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Enclosed is.....**Send Patterns checked**

.....**Patterns P1 (25c)** .....**Patterns P2 (25c)**

Name.....

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City and State.....

Will They Ever Climb Mt. Everest?

[*Continued from page 122*]

built men. Lightweights. So frail do their bodies appear, that on some expeditions they have kidded each other about their lack of physique. But they are wiry, supple, able to balance themselves anywhere. Many are middle-aged; Shipton is 44. They acclimatize better than men of around 20.

Why do they climb? The most often quoted answer was from George Leigh-Mallory, an Englishman who was on the first three Everest expeditions, in 1921, 1922 and 1924. In 1924 he and Andrew (Sandy) Irvine set out to climb the last 2,000 feet to the summit. A man in their party watched, saw the two within 800 feet of the top, still climbing. Then a cap cloud hid the summit, like a curtain closing across the stage at the end of a play. Leigh-Mallory and Irvine never were seen again.

Why They Climb

Before this last attempt, Mallory had been asked, "Why do you want to climb Everest, anyway?" He answered slowly.

"Because it is there," he said.

Are there other reasons? Yes. For fame? No. Mountaineers do not become famous. Money? No fortune was ever made on a mountaintop, and the climbers lecture to pay expenses. The view? You may not get a view, because of snow blindness, or fog, or cloud, or because you are too exhausted to look. To build physique? Everest pulls you to pieces, and climbing her is neither sport nor exercise.

Shipton, like Mallory, answers the question—"Why?"—with the famous understatement of the English race. "We go to the mountains because we like it there."

All mountaineers agree, despite the fact survival looks impossible on the summit, that Everest one day will be climbed. Someone will lick all the problems—and conquer himself as he does. Maybe Lambert will do it this month, or Shipton next May. Whoever it is, he will have climbed the mile that marks the physical limits of the earth, the mile where nothing lives—no bug, no blade of grass. And, so far, no man. END

Supersonic Sounds

A JET that flies at twice the swiftness of sound begins to approach the speed of rumor.—Buffalo *Evening News*.

GETAWAY TIMED BY ELECTRIC EYE. This Chrysler breaks light beams at start and finish of getaway test, while electronic machines measure time. Such quickly responsive engine power makes for sure, safe driving.

CHRYSLER CORPORATION'S NEW DEEP-BREATHING ENGINES GIVE YOU MORE POWER FROM FUEL

Athletes take deeper breaths to get top performance. Chrysler Corporation's new car engines do the same thing. They *breathe* deeper to give you more power and brilliant response.

These compact, low-friction engines inhale and utilize air and fuel more efficiently because of dome-shaped combustion chambers . . . larger valves that open wider . . . straighter channels for the fuel mixture to flow through . . . spark plugs that fire directly above the pistons.

It is an exciting experience to drive the new Chrysler FirePower and De Soto Fire Dome cars — or *any* car that Chrysler Corporation builds. *All* have high-compression power plants.

CHRYSLER CORPORATION engineers and builds **PLYMOUTH, DODGE, DE SOTO, CHRYSLER CARS & DODGE TRUCKS**

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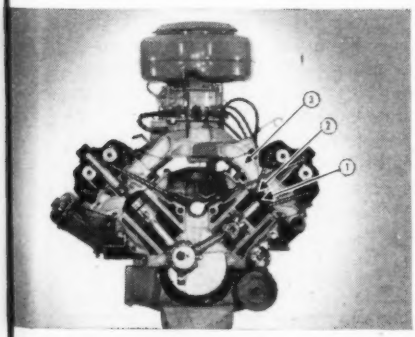


HEART of new De Soto engine. Arrow No. 1 points to dome-shaped combustion chamber. This design permits bigger, high-lift valves (shown by No. 2). No. 3 is wide channel for fuel passage. Note absence of sharp bends that could slow down "breathing."

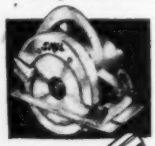
FROM PLANES INTO CARS. Once only some airplanes and expensive, "custom-built" car engines had dome-shaped combustion chambers. Then Chrysler engineers worked out methods that made it possible for the first time in quantity production.

"This modern furniture worth $490 cost only $187*

I saved $303 with my SKIL Home Shop Saw!"

Everyone asks where we bought our beautiful new living room furniture. Buy it nothing! I *built* it in spare time, with my SKIL Home Shop Saw doing the work. And there's no trick to it if you just follow the simple directions—what to do, and how to do it—in SKIL Chart No. 110.

You'd be surprised how much fun it is, how *easy* it is to miter and rip up to 2-inch lumber with a SKIL Home Shop Saw. All adjustments are so simple and quick that even amateurs do professional-looking work! And there's no end of ways your SKIL Home Shop Saw will pay for itself in building an extra room, a garage, and doing odd jobs around the house. Why don't *you* begin with this swell modern furniture? Send coupon and 10¢ for plans!



SKIL Deluxe Home Shop Saw—Model 586—$59.50. 6" saw. SKIL Saw table and accessories easily convert this saw to tilting arbor bench saw, sander and shaper.

SKIL Home Shop Belt Sander $68.00

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Prices subject to change without notice. *For materials only. Local prices vary.

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I enclose 10¢. Please send SKIL-Chart No. 110 showing how to build the above modern furniture.

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Buick Sets New Style for 1953

[*Continued from page 104*]

bined the foreign sports-car look with the comfort they are used to in their own production models.

With this in mind, he sat down one day in the late spring of 1951 to do what most American automobile designers do when they buy a new model—figure out how it can be altered to look different from everybody else's. Ned had just acquired a Buick Roadmaster convertible. He picked up a pencil and began to sketch a Roadmaster that, with minor changes in contour, took on a continental appearance. The changes had to be minor because he was going to have to pay for them himself when he had them made in a body shop, and he wasn't feeling flush.

Makes Hit With Brass

The next day, Ivan L. Wiles, the Phi Beta Kappa who is general manager of Buick, dropped in. He spotted the sketches and walked over to stare at them.

"Say," he exclaimed, "*I* want one of *these* cars!"

Nickles, a bit chagrined at having somebody else pick up and start carrying the ball he had in play, nevertheless was gratified at high-brass approval of his ideas. He was even more pleased when Wiles had a car built to the specifications of the sketches he had drawn.

This was the pilot-model Skylark that I drove.

Fewer Die Changes Necessary

Wiles decided to announce the Skylark to the press, and probably to produce it in very limited quantities as a premium car in 1953. Fewer die changes will be required than are usual in building a new model, because of the lucky circumstance that Ned Nickles tailored the design changes to fit his own pocketbook.

I am completely confident that the demand for this beautiful new car will far exceed expectations. I'm also sure that it will set off fireworks in every design studio in the industry. END

Choose Your Weapons

"You could have knocked me over with a feather," said the pedestrian, getting up from in front of the truck, "and I wish you had."—*Clues.*

SURPLUS MACHINE SHOP TOOLS AT PRICES YOU CAN AFFORD

HIGH SPEED STRAIGHT SHANK DRILLS

SET 6F 30 selected H. S. Straight Shank Drills from 1/8" to 1/2", lengths up to 7". $15 value, only **$2.98**

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SET 35F 6 different size H. S. Drills, 1/4" to 17/32" all with 1/4" shanks. PPD. **$2.98**

SET 36F 10 of above PPD. **$4.95**

Sets 35F and 36F will fit any 1/4" drill.

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5 Drills for less than the price of one new Drill!

SET 32F 5 different size H. S. Drills 1/2" to 1-3/16" **$7.95**

SET 33F 10 different size H. S. Drills 1/2" to 1-3/16" **$14.50**

These new and used H. S. precision Drills with 1/2" shanks can be used in a 1/2" elec. drill or a 1/2" capacity lathe or drill press.

HIGH SPEED MORSE TAPER SHANK DRILLS

SET 9F 15 Different Size High Speed Morse Taper Shank Drills up to 9/16" with No. 1 and 2 tapers. New and used. $50 value. Priced at only **$6.49**

SET 10F 20 Different Size High Speed Morse Taper Shank Drills from 1/4" to 1". New and used. $70 value. Priced at only **$12.95**

SET 15F 10 Different Size High Speed Morse Taper Shank Drills from 1/2" to 1 1/4". New and used. $50 value. Priced at only **$9.95**

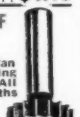
SET 37F 8 Different Size High Speed Morse Taper Shank Drills from 1" to 2" with No. 3, 4, and 5 tapers. New and used. $125 value. Priced only **$29.95**

6 SLITTING SAWS WITH MANDREL

SET 34F 6 Different Size High Speed Slitting Saws, 5 pcs. 2 1/2" dia. x 1" arbor, plus 1 pc. 5" dia. x 1/2" arbor—thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in 1/4" or 1/2" elec. drill. $25 value. PPD. Only **$4.95**

7 selected, sharp H. S. Slitting Saws as above to use on your own mandrel or milling machine. New and used. PPD. A bargain at **$4.95**

HIGH SPEED WOODRUFF KEY SEAT CUTTER



SET 4F 5 different size cutters. Can be used as mounted milling cutter or circular saw. All with 3/8" and 1/2" shanks, widths up to 1/4", dia. up to 1". New and used. Ppd. Priced at only **$3.95**

NEW MOUNTED STONES

SET 27F Mixture of 12 Mounted Stones with 1/4" shanks. PPD. **$2.49**

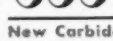
NEW BUFFING WHEELS

Approx. 5/16" thickness, PPD!

5 pcs. 7" dia. $1.70
5 pcs. 8" dia. 1.70
5 pcs. 9" dia. 2.00
5 pcs. 10" dia. 2.50
5 pcs. 12" dia. 2.50

Large quantity available at great savings.

New Carbide Tip Masonry Drills



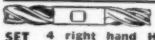
Carbide tip goes through any masonry. Set of 5 bits containing two 7/32" & three 1/4", all five, $10 value, only **$2.75**

NEW ROTARY FILE MIX

7 different pcs., High Speed 1/4" shank, PPD. **$4.49**

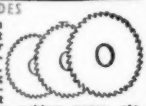
SET 22F 14 different pcs. as above, PPD. **$8.79**

DOUBLE-END END MILLS



SET 29F 4 right hand H. S., 3/8" straight shank End Mills up to 3/8" dia. **$3.98**

LARGE SAW BLADES



These large semi-high speed steel, flat ground, circular blades are in excellent, usable condition. Excellent for cutting brass, copper, aluminum and other soft metals, bone, plastics, rubber, paper, etc.

8x1/16x5/8 arbor ..... $2.50 ea.
10x3/32x1 arbor ..... 2.50 ea.
12x3/32x1 arbor ..... 2.50 ea.
14x3/32x1 arbor ..... 2.50 ea.

HIGH SPEED STRAIGHT SHANK CHUCKING REAMERS

SET 16F 20 Different Size High Speed Straight Shank Chucking Reamers up to 1/2". New and used. Priced at only **$7.95**

SET 17F 15 Different Size High Speed Straight Shank Chucking Reamers from [illegible] to 1". New and used. Priced at only **$7.95**

HIGH SPEED HAND TAPS

SET 12F 6 different size H. S. Std. thread Hand Taps up to 5/8", including a set H. S. Pipe Taps. $2.95

SET 40F the same as above ... $4.80

NEW NORTON CUT-OFF WHEELS

80-grit Mixture. Will cut iron, steels, plastics, etc.

3x1/16x1/8 arbor 3 pcs. 25c
3x1/16x1/4 arbor 3 pcs. 27c
4x1/16x1/8 arbor 3 pcs. 30c
4x1/16x1/4 arbor 3 pcs. 30c
4x1/8x1/2 arbor ..... 25c ea.
8x1/8x5/8 arbor ..... 40c ea.

TAP HANDLE

No. 6 (5/32" to 3/4") Only ... $2.75
Discounts on quantity

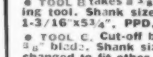
BARGAIN TOOL & SHOP MIXES

- 30 GRINDING WHEELS 1/4" [illegible] diameter max. ... [illegible]
- 12 FILES up to 12" length, a bargain at ... [illegible]
- 2—8" WIRE WHEELS coarse and fine [illegible] thick, 5/8" bore. Pair only ... [illegible]
- 300 SPRINGS all types and sizes ... [illegible]
- 100 MOUNTED POINTS 1/8" and 1/2" shanks. Various shapes ... [illegible]

SURPRISE MIX: Over 50 pcs. for your [illegible] elec. drill including rotary files, [illegible] bits, reamers, grinding wheels and arbors for our customers who like pleasant surprises. Your money back if you aren't satisfied ... **$2.98**

- BEARING MIX: About 40 needle, ball and roller bearings, new and used. Up to 2 1/2" dia. approx. 5 lbs. Outstanding buy at $2.95
- RIVET MIX: 5 lbs. assorted rivets; cherry, explosive, etc. Hundreds of rivets $2.29

NEW 360° SWIVEL TYPE TOOL HOLDER & BORING BAR



Here is a tool that will do the work of a left, right and straight tool holder, plus a boring bar, all for a fraction of its original cost. PPD to you.

- TOOL A takes a 5/16" sq. bit or 5/16" dia. boring tool. Shank size 9/16"x1"x4 3/4". PPD. Only **$3.29**
- TOOL B takes a 3/8" sq. bit or 3/8" dia. boring tool. Shank size 5/8"x 1-3/16"x5 3/4", PPD. Only **$3.95**
- TOOL C. Cut-off blade holder for 3/32"x 3/8" blade. Shank size 1/2"x1"x4 1/2" (can be changed to fit other size cut-off blades). PPD. Only **$2.25**
- TOOL D SPECIAL: 12 H. S. 3/16" sq. x 2 1/2" new tool bits. PPD. **$1.95**

New Hydraulic Hose!!

200 lb. Test

- Any length
- Std. Pipe Connections

5/8" hose has 3/8" male pipe connections and 1/2" hose has 1/2" male pipe connections.

Length in feet	Price 3/8" ID	Price 1/2" ID	Length in feet	Price 3/8" ID	Price 1/2" ID
1	$1.50	$1.65	6	$3.60	$3.75
2	2.25	2.40	7	3.75	3.95
3	2.75	2.95	8	3.95	4.10
4	2.95	3.10	9	4.25	4.40
5	3.40	3.60	10	4.50	4.65

11 to 50 ft. lengths available at 40c per ft. for 3/8" ID hose and 45c per ft. for 1/2" ID hose. All lengths priced complete with connections! Finest construction. Double wire internal braid.

Note: Large quantities available at additional discounts.

NEW VICKERS MFG, 6 H. P. Hydraulic Motor

Unit is compact, powerful. Displaces .507 cu. in. per revolution. 6 gal. per min. at 3000 RPM, 1500 PSI. Positive displacement. Angle type. Rated at 6 H.P. Rotates either direction. Unit can also be used as a pump. Here is the finest hydraulic motor available at a fraction of its new cost of over $200.

Our price only **$29.50**

NEW VICKERS HYDRAULIC MOTOR: serial no. MF107113OBCF2, cu. in. displacement per rev. .378, 3600 RPM 1000 PSI. (unit similar to above only a smaller displacement and H.P.) only $24.50

NEW MASTER HYDRAULIC CONTROL VALVE

For controlling two single or double action cylinders separately or simultaneously. Valve is close center type. 1500 PSI rating, only **$9.98**

PESCO HYDRAULIC GEAR TYPE PUMP

Rated at 3 GPM, 3750 RPM, 1500 PSI. 1/2" drive spline. Gov't cost over $90. Yours for only **$9.49**

GENERATORS!

P1 GENERATOR 200-amp. 24-volt, continuous duty. Wt. 48 lbs. Special Close-out price. F.O.B. Tulsa.. **$14.98**

ESA GENERATOR: 50-amp. 12 volt continuous duty. Wt. 21 lbs. F.O.B. Tulsa. Only **$9.98**

These used, guaranteed serviceable aircraft quality generators are easily convertible for welders, power plants, boats, platers, etc.

1/20 H.P., 110-VOLT MOTOR: 1550 RPM bronze bush bearing. 5/16" shaft. Used, guaranteed serviceable. Wt. 4 lbs. Only **$2.49**

24-VOLT TRANSFORMER: 110-volt A.C. to 24-volt. 3 amps. Just the [illegible] for your small 24-volt motors **$1.95**

NEW GEAR BOX TRAIN:

6 to 1 gear ratio to two flex shaft outlets; one 14" flex shaft included. Unit includes 8 gears and 7 precision bearings. Many other gear ratios possible. Wt. 10 [illegible] PPD. **$8.49**

AIR TANK—REGULATOR—MASK

- A4 Tank, [illegible] x 104 cu. in. vol. 500 PSI ..... $1.[illegible]
- D2 Tank, 6[illegible] 24", 500 cu. vol. 500 PSI 54.[illegible]
- Demand Type Regulator complete with 500 PSI pressure gauge. For above tanks $1.50
- Mask complete with 14" of [illegible] Outlet valve. Fits above regulator [illegible] $1.60

Above equipment suitable [illegible] tanks, compressors, respirators [illegible] units, etc.

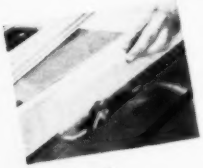
Money-Back Guarantee On RECEIPT of Merchandise. All mdse. mixture of new and reconditioned unless specified new. All orders (Except those specified F.O.B. Tulsa) are shipped Post Paid, saving you up to 25% on total delivered cost!

Write For Free Catalog Describing Thousands of Bargain Cutting Tools.

T & T TOOL 221 W. MLONG TULSA OKLA.

Every Time You Use It...

YOU'LL VALUE ITS CAPACITY AND VERSATILITY!



1 — Shapes

2 — Cuts tapers

3 — Dadoes

SPECIFICATIONS

Max. Depth of Cut	2⅜"
Table Ahead of Blade	10⅝"
Rip to Center of	19" panel
With one extension	36½" panel

Saving you time, money and improving work accuracy *every* time you rip or crosscut a board to size is *just the beginning* of this saw's usefulness.

It handles easily and accurately such sawing operations as cutting angles, double angles, chamfers, bevels, tenons. And with low cost Atlas accessories it cuts all dadoes...handles a host of straight shaping and moulding operations.

Atlas is *the* saw for your shop. Its double-locking patented fence is the best you'll find on any saw. Blade tilts — your work stays flat — for safe accurate angle sawing. Has sealed-for-life ball bearings. Precision-ground grey-iron table. Grill extensions, original with Atlas, for handling big stock. See these and many other features at your Atlas dealers, or send for catalog today.

NEW 20-PLAN BOOK ONLY 50¢

20 original, practical projects for your home and family . . drawings photos, step-by-step instructions. Send check or cash (no stamps) $.65 outside U.S.A.

ATLAS PRESS COMPANY
1025 N. PITCHER ST., KALAMAZOO, MICH.

'Space Men' Make College Men Think

[*Continued from page 127*]

covering. . . The plant continually sends up new shoots which grow from the fibrous base and contribute to the density of the surface area. After a period of one year, the surface is so clotted with fiber that it becomes coarse and undesirable, and soon a mass dying takes place. The roots in an area of three or four square feet die simultaneously because of strangulation, leaving bare, unsightly spots upon the lawn, dotted with the large dead fibrous roots. . .

"The only solution is to pull out areas of the grass to allow for new growth. This must be done at randomly spaced intervals to insure a uniform root surface, and the amount pulled out must be very small. Because of the toughness of the roots in tension, pulling too large a clump will uproot—oops, upstem—a large portion of the plant and the result is an open space to be planted again. The vertical force to be applied to the surface fiber to upstem it cannot exceed six pounds. . .

"When one heads home from work after a hard day at the office, he sees one Methanian after another plucking away at their lawns, most of them using their own wonderful cussing that they've developed. . ."

Students Build Models

With these stringent requirements, a student designed a fancy machine called the Cleen-Pull Lawn Conditioner that would pull up 40 tufts of root, put the tufts in a drawer, and smooth and ruffle the surface to make it more attractive. It is powered by a hydraulic system activated by a hand-pumped cylinder. Wherever possible, light metals are specified to make it light enough for the feeble Methanians to lift.

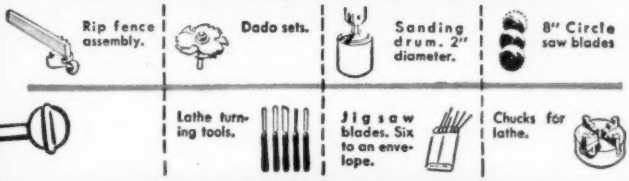
No report on sales is available.

Does this sort of thing actually help in creative thinking? Professor Arnold points out that the best students, as shown in their over-all college records, do the best with the Arcturus project. They are stimulated and interested by it, while less gifted students are often bewildered and tend to dismiss the whole idea as silly.

The Arcturus project is of course only a quarter of the whole seminar on project design. Another portion is devoted to the design of new tools and the improvement of existing ones. Students have designed such useful new machines as a sander that either

[*Continued on page 268*]

OTHER FAMOUS SHOPMASTER ACCESSORIES



SAVE HOURS OF HARD LABOR
CUT SQUARE OR RECTANGULAR HOLES WITH A
SHOPMASTER MORTISING KIT

Save hours of unnecessary work of hand chiseling with a handy Shopmaster Mortising Kit. Cut square or rectangular holes with your present drill press . . . easily attachable . . . easy to remove too. Just one of the many famous accessories available by Shopmaster.

$14.50

FREE Complete catalog of the famous quality Shopmaster tools and accessories . . . Write Department PS10

1214 Third St. South, Minneapolis, Minnesota

GIGANTIC EXPANSION

MAIL SALE

WAR SURPLUS EXCESS INVENTORY BANKRUPT STOCK

BURDEN PAYS ALL SHIPPING CHARGES

POWER PLANTS and GENERATORS

- **Master Plants,** 5KW, 115-230-v, 60-c, 4-cyl. engine, manual start. Cost over $1100.....**$531.70**
- **Onan Plants.** 5KW, 115-v, 60-c, 4-cyl. engine, push button start. Cost over $1400.00.....**$689.50**
- **Burdex Plants,** 2KW, 115-v, 60-c. Special **$297.50**
- **Homelite Plants,** 1.5KW, 115-v, 60-c. Special **$199.50**
- **Kato Generators,** 5KW, 115-v, 60-c, with control panel, drive pulley, etc. 1800 RPM. 1 phase. Cost $550 .....**$259.50**
- **Burdex Generators,** 115-v, 60-c. Ball bearing. 500-w, **$94.50;** 1000-w, **$134.90;** 200-w, **$159.50**
- ● *Many other plant bargains in catalog.*

WINCHES—CLUTCHES—BLOCKS

- **Boat,** dock, business hand winch, 1-4 gear ratio. Special.....**$19.95**
- **Farm-Truck-Contractor** heavy duty hand winch. Dual ratio 1-3, 1-9. Finest cast steel construction. Special **$29.98**
- **Chain Hoist.** Lever type. 3000 lb. capacity **$19.48**
- **Winch Cable.** ¼" super-flexible (4000 lbs. cap.) 50' with load hook **$9.90**
- **Army Snatch Block.** 13,000 lb. List $19.40 ..... **$12.95**
- **Clutch,** 6 H.P. Many uses..... **$14.95**

WELDING GENERATOR KITS

- $276 Aircraft 200-250 amp. 28-v, generators. Complete with cooling fan, field rheostats and "How to Build" welder instructions.....**$24.65**

PHONES—CITY and RURAL

- **Rural Magneto.** Compact oak case. Wall, (a) 3 bar, 1000-ohm, **$9.95;** (b) 4-5 bar, 1600-ohm, **$13.90. CITY** upright desk, with bells **$4.99.** Phone only, **$2.69.**

AIR POWER GREASE GUNS

- Super special genuine Lincoln automatic air power grease guns. Ideal for farmers, contractors, etc. Operates off any compressor. List $60.80. SALE **$23.95**

AIR COMPRESSOR UNITS

Paint, blow up tires, control termites, clean greasy engines, blow dust, etc. Build your own or buy ready-built units.

- **DeLuxe Air Kit.** Consists stainless tank 12"x24", finest 1-cyl. 3 cfm piston compressor, valves, gauge, fittings, hose, excellent paint gun, blow gun, pressure regulator, chuck and "How To Build Portable Outfit." Special **$45.49**
- **Economy Air Kit.** Same as above except 6"x24" tank and no regulator or paint gun. Each.....**$31.90**
- **Air Components.** Top quality. 1-cyl. piston comp. **$20.50;** 2-cyl. pis. comp. **$49.50;** Adj. Auto. pressure switch, **$4.95;** pressure regulator. **$2.65;** Adj. safety valve, **$1.95;** Pressure gauges, 0-160 lbs. **$1.89.**

Write for interesting Air Data-Catalog

TRACTOR WEED SPRAY OUTFITS

- Leading make. All stainless steel. 7-row outfit. Guaranteed finest unit made. List $225.50. Buy now to save on this year's taxes.
  Special Fall Closeout.....**$129.50**
  5-row all-brass outfit..... **79.50**

SUPER BARGAINS

- **Duro 110-v Hand Hi-Speed Ball Bearing Grinder and Kit.** List $24.50. Sale.....**$13.40**
- **Hydraulic Tractor Contour Level.** Mounts on tractor. Plow on perfect contour. No surveying. List $46. Sale.....**$16.90**
- **Polished Laminated Plane Propellers** (New). Many uses—snow sleds, boats, etc. Cost over $150.00. Sale.....**$12.95**
- **Electric and Gas Chain Saws.** Write for prices.

SPECIAL FOR THE MONTH
BATTERY CHARGER (6 Amp.)

Leading make 110 v, 60c, 6 amp. chargers. Install in garage, keep car battery fully charged for easy winter starting. List $18.95. SALE **$12.15**

- **Battery Trickle Chargers,** list $9.95. Special..**$4.95**

WATER PUMPS and SYSTEMS

Save up to 60%. Ask us for expert advice on your problem. Pumps for wells, basements, weed spraying, septic tanks, garden irrigation, etc.

- **Centrifugal Pumps.** Cast iron, stainlena steel shaft, bronze impeller, ball bearings. No. 75, ¾", **$18.90;** No. 100 1", **$28.90;** No. 150, 1½", **$35.60.**
- **Bronze Rotary Pumps.** *Low pressure type.* (25 lbs. max.) Self priming. No. 12, ½", **$12.75;** No. 34, ¾", **$16.95;** No. 101, 1", **$22.95;** *Hi-Pressure type* (150 lbs. max.) No. 612, ½" **$14.50;** No. 634, ¾", **$20.95;** No. 610, 1", **$27.95.**
- **Irrigation War Surplus Pump.** 10,000 g.p.h. 2½" intake. Two 1¾" outlets. Special....**$39.50**
- **Burdex Shallow Well System.** 110-volt, 60-c. 300 g.p.h. 40 lbs. pressure, fully automatic. Easy to install.....**$69.50**
- **Adj. Auto Pressure Switch. $4.95;** ¾" foot valve, **$2.49;** pressure gauge 0-60 lbs. **$1.89;** also hose, strainers, etc. at real savings.
- **Hand Pump.** Lever type, high capacity. Pump basements, tanks on farms, etc. Cost $35, **$27.80**

Write for useful Water Pump Data-Catalog

ARMY HOT AIR HEATERS

Forced air type. Burns gasoline, kerosene or fuel oil. Thermostatic control. 110-v. blower. Tremendous heat output (40,000 BTU.) Compact portable size 17½" high, 21" long. Wt. 44 lbs. Cost over $190.00. Sale.....**$59.50**

Miscellaneous Surplus Bargains

- **Tachometer.** 0-4000 r.p.m. Direct rd. **$6.79**
- **Drawing Sets.** Finest quality, 13-pc... **9.89**
- **Clock Timer Switch.** 110-v. 60-c..... **4.72**
- **Heater Elements.** 110-v, 2000-w..... **.99**
- **Imersion Heater.** 110-v, 800-W..... **3.95**
- **Guy-Turnbuckles.** 12" Army. Useful. 10 for **3.89**
- **Motors.** 110-v, 80 r.p.m..... **8.95**
- **Hydraulic 19" Cylinders** (Cost $90)..**18.49**
- **D-C Welding Generators** (250 amp.) **99.90**
- **Magneto Farm Telephones.** 1600 ohm **13.90**
- **Engineers Hand Level**..... **5.84**
- Hundreds other bargains in tools, etc.

ORDER FROM AD, or Write for 4 FREE Catalogs!

OUR 30-YEAR POLICY: ● Everything Guaranteed Satisfactory ● We Pay Shipping Charges in U.S.

FREE CATALOG

BURDEN SALES COMPANY

832 "O" St. Lincoln, Nebraska

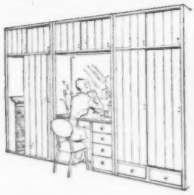
New, faster way to strip off finishes

Non-inflammable KLEAN-STRIP peels off paint, varnish, lacquer, enamel, synthetics.

IT'S CLEAN—NO AFTERWASH!
Sold at leading paint, hardware and department stores.
Product of
The KLEAN-STRIP Co., Inc.
2340 S. Lauderdale, Memphis 6, Tenn.

Introducing

NOVA PRECISION-BUILT WALL UNITS



Space-savers—money-savers! Precision-built—assembled in 30 minutes! Here are wardrobes, vanity units, dressers, desks, bookshelves, storage walls—each a beautiful piece of furniture in itself; used in combination, there is no sense of sectionalizing.

10" to 26" in depth—they can even take the place of a wall, save as much as 5 feet in total house length. Wide choice of woods—unfinished, or with prime coat, paint, stain or furniture finish. Inner walls and backs are insulating, sound-deadening, mildew-proof. Write for free fully illustrated literature. Dept., 64B—NOVA SALES CO., Trenton 3, N. J.

'Space Men' Make College Men Think

[*Continued from page 266*]

oscillates or rotates, as desired, and a two-speed power hand drill.

This fall Arnold added a new workshop to his setup, so that his students can actually build their machines—or models or mock-ups—whether designed for 2951 or 1952.

Professor Arnold is convinced of the need for creative thinkers—and for what he calls product designers. Taking an existing product, the product designer first tries to make it more efficient and also more versatile. He simplifies the design so that it is cheaper to make. Finally he tries to improve its appearance and sales appeal. The same technique applies to new products.

Creativity, Professor Arnold believes, is not necessarily something you have to be born with. In fact his whole course is based on the idea that it can be taught. Partly, he believes, it's a matter of day-dreaming, or of speculative thinking. All too many scientists don't care to speculate; they leave that to the science-fiction writers.

Arcturus Designs Pay Off in Earth Money

Industry seems to agree with Arnold that it needs product designers. His students find a wide choice of jobs offered them on graduation; the demand is greater than the supply. One man last year got a $7,800 job right after commencement—so Arcturus IV apparently pays off in good earth dollars.

Meanwhile the design of new products for the Methanian market goes ahead. Rapid transportation needs—automatic controls are called for because of the Methanians' slow reaction time—are still to be met. Something must be done about the burrowing animals that eat the Methanian crops. Methanian agriculture in general is still mostly hand work; all sorts of farm machinery are needed to raise the standard of living.

The industrial designers of Massachusetts Intergalactic Traders – MIT to you – have plenty to do. Whenever our space explorers really get going, they'll find the products ready for an export drive such as the Milky Way has never seen. END

Watch Out

BROWN: "How is the new stenographer you've got?"

GREENE: "Fine, except she's a little clock-eyed."
—*Baltimore & Ohio Magazine.*

FOR EASIER SCRATCH-FREE SANDING . . . . . USE DREMEL STRAIGHT-LINE ACTION SANDERS

FOR ALL HOUSEHOLD AND WORKSHOP SANDING

You'll find Dremel Electric Sanders indispensable around the house and workshop. Thousands of satisfied users have proved only Dremel straight-line action sanding can produce professional-like, scratch-free surfaces. Both models sand with-the-grain, are durably built to give years of service. Avoid slow, tiresome hand sanding. See "where to buy" instructions at the bottom of this page.

MODEL 2000

A high-speed, fast-cutting production sander for home and shop use. Its straight-line, with-the-grain action is ideal for redecorating jobs, furniture and cabinet making, boat building or refinishing, etc. Recommended by painters and carpenters for sanding woodwork, doors, stairways, dry wall joints, etc. Weighing less than 5 lbs., it is perfect for difficult vertical and overhead sanding jobs. Has 21 sq. in. (3⅛"x7") sanding pad surface.

Price includes this sturdy steel storage case (shown below) with handy carrying handle; 25 assorted abrasives; 1 sheepskin pad $24.50

MODEL "A"

The lighter capacity Model "A" Sander is an excellent all-purpose household sander for home maintenance, furniture finishing, hobby projects, etc. Wonderful wax polisher. Perfect for massage use. Weighs only 2½ lbs.; has 12 sq. in. (2⅜" x 5⅜") sanding pad surface. **$14.85**

Price includes:
- **6 sandpapers,**
- **1 sheepskin,**
- **1 felt pad.**

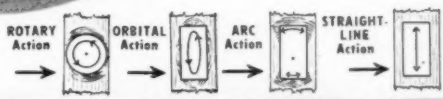
To produce flawless work of professional quality, all sanding must be done **with** the grain of the wood. Therefore when selecting a Sander, it is important to remember that **only Straight-Line,** with-the-grain action is suitable for finish sanding operations. For the finest finishes, insist on a Dremel.

Note How Dremel With-The-Grain Action Eliminates Cross-Grain Scratches

FREE SANDING GUIDE

A handy "How-To-Do-It" booklet containing helpful hints on sanding and refinishing procedures is packed free with each Dremel Sander. Extra copies available for $.25.

BOTH MODELS FEATURE: Only 2 moving parts; easy one-hand operation; 10-second paper change; 14,000 strokes per minute; 110-120 V., 60 cycle, A.C.



A "must" for sanding dry-wall joints.

Fast—cuts refinishing time in half.

Sands right into tight corners.

Prepares furniture for repainting.

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FASTEST MOST POWERFUL TOOL IN ITS CLASS—APPROX. 27,000 R.P.M.

Most practical tool a man can own—more powerful than any similar tool you can buy. Works well in wood, plastics, and metal. For home maintenance jobs you'll wonder how you got along without it. For model making it's a must. And for general shop operations it saves time and money. Compare it, try it, buy it. You be the judge.

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KIT NO. 2. Includes Model 2 Moto-Tool and 23 Accessories (High-Speed Steel Cutters, Grinding Wheels, Polishers). Packed in sturdy hardwood cases. **$23.50**

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MOTO-TOOL NO. 2. Offers more convenience and long life features for the money than any other hand grinder. Thousands of satisfied users. Moto-Tool No. 2 (With 1 emery wheel point) **$16.50**

SEE YOUR LOCAL DEALER. Dremel Tools are sold at better dealers everywhere. If your dealer can't supply, order direct on a five day trial, money-back guarantee. Remit in full, and we will ship postpaid. Or, send only $2.00 now, pay postman balance plus postage and C.O.D. fee.

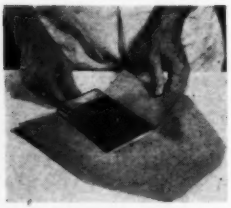
DREMEL MANUFACTURING CO. Dept. 102-K RACINE, WIS.

Pointers for Home Painters Floors:

Remove wax and polish by washing floor with turpentine. Wipe dry. Unless this is done, finish coats may not dry or stick properly.

Paint in areas about four feet square. Start in far corner and work toward door. For best results use wide nylon-bristled brush—one designed for the job.

On open-grained floors, brush wood filler into pores. Rub across grain with burlap to remove excess. Let dry. Sand lightly with grain. Clean with cloth moistened with turpentine.



To store brushes for long periods, clean thoroughly and wrap securely in manner shown here. Brushes stay in better condition when they're kept in good shape.

JOB AFTER JOB, you'll get best results with a well-tipped nylon paint brush. Durable Du Pont nylon bristles paint smoother . . . are clean and sanitary . . . never get brittle . . . don't break off even under the roughest treatment. And nylon bristles last from 3 to 5 times longer than ordinary bristles. Leading manufacturers make nylon paint brushes in all types and sizes. Look for the name NYLON on the handle. Be sure to pick the size brush designed for the job . . . and demand Du Pont nylon bristles.

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. . . through Chemistry

The best brushes have
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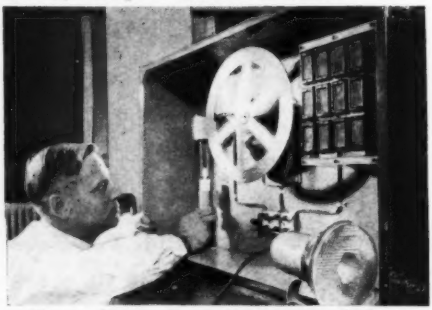
Lightning Goes Down and Around

A NEW high-voltage lightning arrester sends lightning down a "spiral staircase" to keep it from damaging equipment at power stations. Conductors angling between the three vertical columns carry the lightning groundward. The arrester was designed by A. M. Opsahl, Westinghouse engineer, shown above with a model. A full-size installation will stand 10 feet high, only half as tall as former high-voltage arresters, which required large structural-steel supports.

Motor Taps Sun for Power



THIS solar generator converts sunlight into enough electrical energy to spin a balsa-wood wheel on the shaft of a small motor. Light falling on photoelectric cells generates the current.

If sunlight is not available, heat from a burning candle or a 150-watt electric bulb can do the trick. The heat is converted into electrical energy by a bank of thermocouples. The "grownups' toy" was built by General Motors engineers to demonstrate solar power in their science shows.

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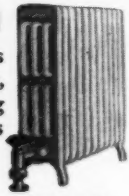

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Science Explains Why Minerals Glow When Heated

By learning what makes some mineral crystals glow in the dark when heated, University of Wisconsin scientists have solved a long-standing mystery.

The strange phenomenon is known as thermo-luminescence. Unlike ordinary incandescence—the familiar glowing of any object when raised to red or white heat—thermo-luminescence takes place at a lower temperature and lasts only a moment or so. It is more common than is generally realized. Anyone may observe thermo-luminescence by grinding a small piece of limestone into powder, putting the powder in a frying pan, and heating the pan nearly red hot in the dark.

Radioactive Minerals Are Cause

What makes minerals thermo-luminescent, the scientists found, is radioactivity of uranium and thorium scattered throughout the earth's rocks. The radioactivity drives electrons into "traps" in the lattice-like structure of crystals. When the crystals are heated slightly, the electrons escape from the traps and emit light in the process. Because most minerals contain only an infinitesimal amount of uranium or thorium, centuries are required for the trapping of enough electrons to give a few seconds' glow.

No practical use of this phenomenon has been made up to now, but the Wisconsin group, proposes one. During an atom-bomb blast, its report suggests, radioactivity would be so intense that crystals of lithium fluoride would trap sufficient electrons in a few seconds to glow when heated. If a person were wearing a "dog tag" of this material, the amount of radiation striking him would determine the intensity of the glow. The Wisconsin scientists have designed a thermo-luminescent apparatus to heat the crystals and measure the amount of light emitted. Using such a device, authorities could quickly divide a population exposed to A-bomb radiation into groups requiring similar medical treatment.

Renewing Car Upholstery

Mohair upholstery in a car may eventually mat down. If so, place a damp cloth over the matted area and run a hot flatiron over the cloth. Then brush the nap upright.

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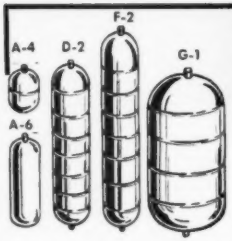

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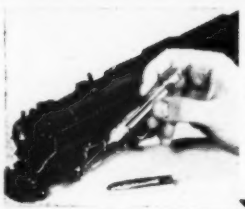

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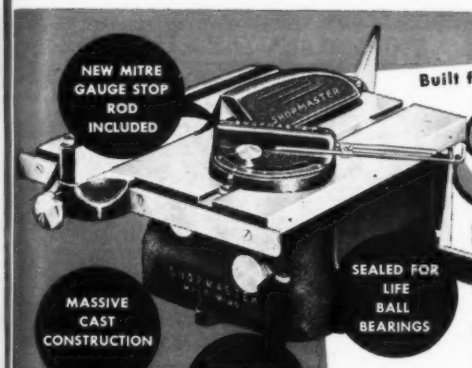

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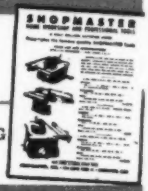

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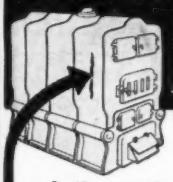

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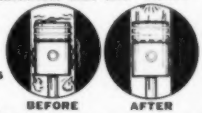

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Records show that being thrown against the dash or windshield and being thrown out of the car in accidents are the chief causes of fatalities and serious injuries. In most cases, use of a safety seat belt would have prevented those deaths and injuries. Safety seat belts reduce body fatigue on long drives and increase your control over your car. Belt has instant release buckle. Your choice of blue, black, grey, green, yellow or red webbing. Meets all government safety standards. Easily installed on any car seat.

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Replace your present stock (single point) ignition with a dual point breaker plate. It increases cam angle from 31 degrees to 36 degrees dwell and also increases coil saturation to full capacity. This plate produces a hotter spark . . . giving better mileage, easier starting and smoother performance. Features "super" size dual tungsten points. The only 8 cyl. plate available with 50 precision ball bearings. **Fits:** '37 to '52 Oldsmobile 8's, Pontiac 8, Buick 8, Studebaker V8, Cadillac V8, also Packard '51 to '52 (with Delco Dist.). Postpaid **$11.95**

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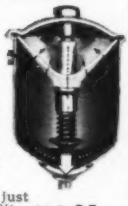

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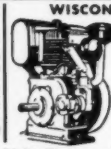

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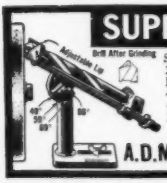

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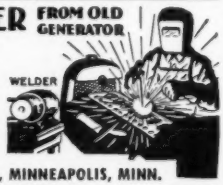

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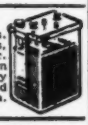

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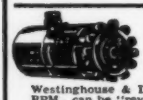

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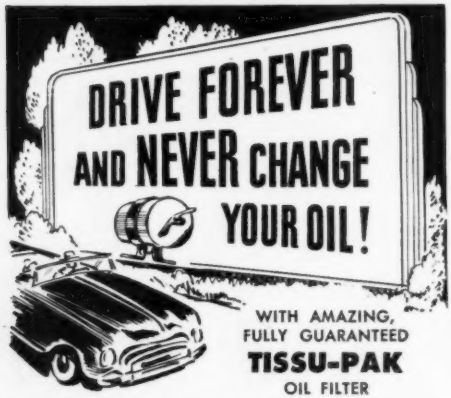

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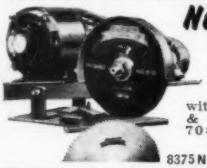

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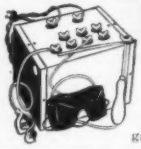

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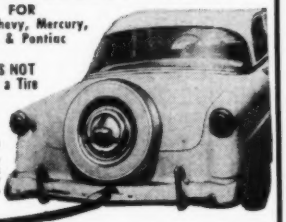

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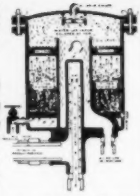

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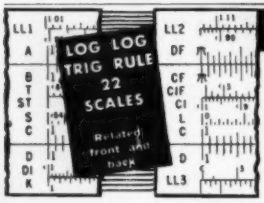

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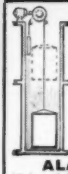

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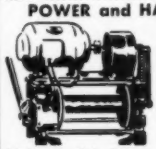

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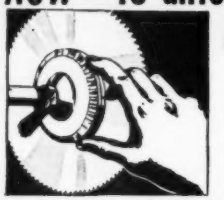

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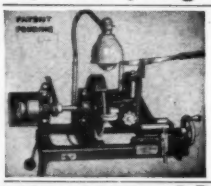

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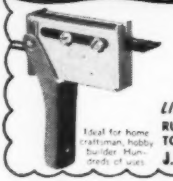

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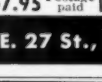

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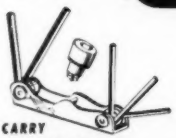

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NEW GENUINE ARMY

Made of heavy, white duck. Wind and water resistant. Slip-over type with draw strings on cuffs and around waist and hood. Neck has 4 tie straps for adjustment. Body is finger-tip length with 2 large outer pockets. Designed to be easily worn over other clothes. Ideal weather protection for the outdoor sportsman, hunter, **2.49**

MARCHING COMPASS

Here is a precision compass of unusual accuracy & dependability. Has a prismatic, hair-line guide for sighting at distant objects and at same time reading degree of setting. Needle is jewel mounted. Has luminous dial for night use and canvas carrying case. **3.95**

NEW!

HY-SCORE .177 CAL. AIR PISTOL

Recommended by General J.S.Hatcher in April '52 issue of American Rifleman. No pumping necessary – just cock and fire. Has ALL STEEL rifled barrel, 7-3/4" long. Gives higher muzzle velocity than any other Air gun. Shoots .177 caliber pellets or darts. Ideal for use in shooting small game or targets. Also available in 22 cal. or BB. Write for information on other models. **14.95**

MAKE YOUR OWN POWER DRIVE

AS SEEN IN AUGUST ISSUE OF POPULAR SCIENCE

Here's a unit PACKED WITH BRUTE FORCE! Does all those hard, heavy jobs that ordinary power tools cannot handle. Easily made from a vacuum cleaner type motor, a gear reduction drive and a few homemade parts. Can be used for turning large nuts & bolts, digging post holes, drilling large holes in wood or metal, driving power tools & machinery, lifting, pulling, pushing, and any job where a slow speed with high torque is required. YOU CAN'T STALL IT! Lightweight, easy to handle. Has 1000's of uses in home, garage, shop, factory. We supply complete instructions as compiled by Popular Science Mag.

COMPLETE UNIT

MOTOR **3.25**

GEAR BOX NEW **12.95** USED **6.25**

4 TAKE-OFF DRIVE UNIT

Has many uses where 1 to 4 different take-offs are needed. All four drives turn in unison from the common power input. Drive is adaptable to use with 9/32" flexible drive shafts & accessories. **3.75**

AIR CORPS PARALLEL RULER

A valuable asset to the navigator, engineer, draftsman or mechanic. Heavy, durable plastic with guide knobs on top. Has rubber pads on bottom to prevent slipping. Beveled edges for use with pencil or pen.... **98¢**

NAVY Sealed Beam SPOT LAMP

U.S. NAVY Portable Searchspot light. Has pistol grip & aiming sight. Makes an ideal search, spot or emergency for auto, boat, camp, etc.

12V. light – 4" lens . . . **4.29**

24V. light – 4" lens . . . **4.79**

Set of 3 filters: red, green, amber. (specify type lamp) . . . . . **99¢**

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RADIO MIX

A veritable "TREASURE CHEST" for "ham" operators and experimenters. Contains: Headset, Mike Button, Trans. Wire, Insulators, Switches, Condensers, Rheostats, Terminals, Jump Cable, etc. Approx. 8 packed lbs. for ONLY – **2.49**

USAF THROAT MICROPHONE

Genuine USAF type T-30-0. Gives distinct voice reproduction for aircraft or amateur radio broadcasting. Consists of two microphones, mounted on rubber neckpiece elastic neck band. Operates between 100 & 300 ohms . . . **1.39**

MICROPHONE

Popular telephone type, highly sensitive. Has excellent, clear tone. This was the Signal Corps favorite. An ideal instrument for the Radio "ham" and professional recording studio, for broadcasting, home recording, public address systems, etc. Comes complete with cord & plug. **3.29**

SIGNAL CORPS TEL. KEY

The new model J5A with ball type, flame-proof, metal key, perfectly balanced to permit positive contact with minimum effort. An ideal instrument for "ham" or professional use. A BUY at . . NEW **1.89**

ALNICO SPEAKER

Permanent magnet type. 4" diameter. 2 wire hookup. Ideal for small radios, inter-com systems, test equipment etc. NEW **2.49**

SURPLUS JEEP CANS

FOR RESERVE GAS SUPPLY – Holds 5 GAL. Has screw top and will take standard flexible nozzle . ONLY . . . . . **1.39** EA.
FLEXIBLE NOZZLE . . . . . 49¢

ELECTRIC MOTORS

696 – DELCO MOTOR

1/50 HP, 24v DC, 1.6 amp. turns 3000 RPM. Has adj. overspeed contactor to stabilize and control speed. Length 5½". Diam. 3". ONLY **4.95**

SAMSELL MOTOR

27 volts, 16 amps, 1/5 H.P. reversible, series wound motor. 3800 RPM, shaft 9/32" diameter. 12-spline. 4-1/8" x 2-3/8". NEW ONLY **3.95**

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No. 500 – Used 1/2 HP - 27 volt, DC–AC. This motor can be readily adapted to deliver up to 1/2 HP on 110 volts AC by the simple method of rearranging armature brush-leads. Free Diagram with each order. A SENSATIONAL VALUE. **5.95**

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Mechanical Sports Are Coming

[Continued from page 99]

skill in preparing his machine as well as his skill in handling it. In the near future we may expect developments of great interest by such things as the use of rockets to gain rapid acceleration in all kinds of motor racing.

"Speeding up" is only another phrase for civilization and we are observing its effects even in the more conservative sports, such as fishing where "radar" has been used to detect fish. Deep-sea fishing has been conducted with radio attachments to a harpooned fish and there seems no reason why such an apparatus should not be attached to a fox.

It is, perhaps, a pity that the tradition of "working sport" has almost died out. Covent Garden porters used to test their skill in carrying baskets; Paris waiters, their speed and sense of balance in racing with loaded trays. Tree-felling has become an established sport down under in Australia and log-rolling is popular in Canada.

In boxing an electrical machine could register blows struck below the belt.

There are great possibilities for the development of more mechanized sports in connection with industry. We may yet see competitions between giant grabs removing a pile of debris. It is plain from the crowds of "rubbernecks" who watch "men at work" that this kind of thing has a certain spectacular appeal and it has the advantage over older sports in that it is useful. As in motor racing, manufacturers would be stimulated to produce faster, more reliable and more efficient machines.

The Floor Will Dance

Or we may see races between radio-controlled planes in which there will be a test not only of mechanism but of the skill of the controllers. The development of such sports seems to be foreshadowed by the extreme interest of the younger generation in such things as powered aircraft models. Young men would take more readily to the sport of kings if the electronic jockey became fashionable.

Human beings are less and less inclined to physical effort and it has been said that one day a dancer will expect to stand still while the floor does the work. All motion, we shall be told, is relative.

It is very much more useful and sensible to engage in sports which stimulate quality and research that can be applied in industry. Science has contributed a great deal to all sports. Tennis balls are now kept in refrigerators so that they will have uniform bounce. Footballs are tested for their bounce by ingenious machines instead of by the naked eye. New methods of making golf balls have been devised which make them travel farther and truer. Even fishing reels have been improved so that errors on the part of the angler do not result in overrunning or breakage. In the not-distant future we may see the same urge applied to sports derived from more productive industry.

Sport Aided Aviation

There are many precedents. The bullfight and, more recently, the rodeo, evolved from purely utilitarian practices into pure "sports." Early aviation was greatly stimulated by the sporting element; the development of the aircraft for military and commercial purposes came much later. Without the early races and meetings the airplane might have remained for many years as a clumsy and useless affair of "bamboo and string."

We are approaching the time when the majority of human beings will belong to the "idle classes." It will be a tragedy indeed if, science having provided the leisure, men and women can find no better use for it than a search for forgetfulness. END

How Pig Can You Get

THE price of hogs has been steadily advancing, but the road hogs are as cheap as ever.

—Fireman's Fund Record

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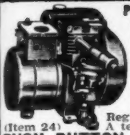
PORTABLE LIGHT PLANTS



350 watts— 115 v. D.C. powered by a sturdy, easy-starting $1\frac{1}{2}$ hp. Briggs engine, perfect for lights, radios, razors, etc. in cabins or trailers. Use standard light bulbs. Built-in control box with receptacle—just plug in. Weighs only 65 lbs. Item 273. Reg. price $199.50. A terrific value at **$99.75**

(Item 24)

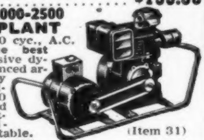
PUSH BUTTON START A.C. PLANT

500-700 watts—115 v.—60 cyc. A.C. Powered by a rugged 2 hp. easy-starting Briggs gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, pump, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts., trailers and camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Item 24. Wt. 85 lbs. Fully guaranteed. **Be prepared if war or storm knocks out power lines.** Reg. $275 value....... **$143.50**

700-800 Watt Plant (Item 44) same as above but larger engine....... **$169.95**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine **$199.50**

GIANT 2000-2500 WATT PLANT



(Item 31)

110-120 Vo 60 cyc., A.C. **Absolutely the best made** — exclusive dynamically balanced armature: heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted — portable. Powered by easy starting Briggs or 6 hp. Wisconsin engine —complete with all accessories: engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and instructions included. Wt. 220 lbs. Reg. $585.00. Special at... **$299.50**

With Electric Self Starter (Item 179) **$359.50**

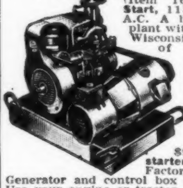
GENERATOR ONLY and control box. Drive it with your engine or tractor.. **$169.50**

3000-3500 WATT PLANT

(Item 198) 110-220 v.—60 cyc. A.C. with Wis. Engine, **push button start.** Wt. 370 lbs. Heavy duty....... **$399.50**

Generator only for belt drive, Wt. 115 lbs. (Item 198A)...... **$239.50**

HI-LINE 6000 WATT PLANT



(Item 162) **Push Button Start,** 115-230 v. 60 cycle A.C. A brute of a power plant with a rugged 13 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995.00. **With self starter.** Factory Spec. **$645.00**

Generator and control box only, belt driven. Use your engine or tractor. Wt. 240 lbs.................. **$345.00**

Write for information on any sizes not listed

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MASTER AIR COMPRESSOR

(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and auto tires, greasing, and the hundreds of other jobs done by compressed air. Piston type. 2" bore compressor with built-in air filter. Master built with hi-strength alloys and precision bearings. Stainless steel tank, 12" x 24". 2100 cu. in. cap. Safe up to 300 lbs. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Note low factory prices.

With $\frac{1}{3}$ hp 110 v. A.C. motor (Reg. $175.00) (Item 209)........ **$98.50**

With $\frac{1}{2}$ hp motor (Reg. $199.50) (Item 209A)..... **$119.50**

With 2 hp Briggs Gas Engine (Reg. $199.50) (Item 209B). **$109.50**

Compressor only (2"x$1\frac{3}{4}$") (top quality) (Item 209C)......... **$20.50**

Larger Compressor (2"x2") (none better) (Item 209D).......... **$24.50**

Giant Compressor (twin $2\frac{1}{2}$"x2") (Item 209E)....... **$54.50**

A complete line of spray guns and air tanks available at factory prices.

IMMEDIATE DELIVERY—ALL ITEMS

HEAVY DUTY D-C ARC WELDER

(Item 38)

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to $\frac{3}{4}$" plate using $\frac{1}{4}$" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. You can pay more, but you can't buy a better welder. Wt. 110 lbs. $400 value at. **$99.75**

DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Spec. **$119.50**

WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at... **$10.50**

EXTENSION CORD

(Item 16) 40 ft. heavy **duty,** made of specially insulated No. 14 2-con**ductor wire. So tough that you can drive over it and yet flexible and easy to handle.** Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. $2\frac{1}{2}$ lbs. Usually $4.50—Special 40 ft. **$1.99**

Comb: 2-40 ft. and 1-20 ft. (total 100 ft.) **$4.95**

100 foot length (one piece).......... **$4.85**

WIRE ONLY (Item 50) No fittings, 100 ft. **$4.00**

HEAVY DUTY POWER CABLE

#12—2 Cond.—stranded, very flexible, rubber covered, special outside conductor for grounding power tools, etc. Finest heavy duty power cable made. U.S. Surplus.

50 ft. (Wt. 8 lbs.) Item 199....... **$6.95**

100 ft. (Wt. 16 lbs.) Item 200...... **$12.95**

79 Pc. CARPENTER'S TOOL SET

Professional quality. A complete set of Master Mechanic tools featuring the famous **Stanley** brand. All neatly arranged in a beautiful sturdy 32" hvy. steel tool box. Set includes: Powerful $\frac{1}{4}$" Electric Drill (optional), 3 Stanley Wood Chisels, 29" Spring Steel Saw, Steel Bench Vise, Tin Shears, 9 Drill Bits, Sharpening Stone, 8" Plane, 24" Stanley Level, Hacksaw, Stanley Rule, 5 Double End Wrenches, 13 Asst'd. Hacksaw Blades, Stanley Hand Drill, 10" Vise Wrench, Comb. Square, Stanley Hammer, Stanley Ratchet Brace, Coping Saw, 7 Coping Saw Blades, Steel Wrecking Bar, 4 Screw Drivers, Offset Screw Driver, Nail Set, 4 Asst'd. Files, 8 Pc. Allen Wrench Set, Auger Bit Set and many other tools. Worth at least $150.00 if purchased separately. Save cost of tools on one or two jobs. A terrific value.

Item 242. Wt. 41 lbs. (without Electric Drill) **$39.50**

Item 242A. Wt. 45 lbs. (incl. Electric Drill).............. **$49.50**

Tool box only Item 243. Wt. 15 lbs.......... **$8.95**

POTTER'S WHEEL

Power Driven — Foot pedal speed control

New compact modern design. Precision built to meet exacting requirements of professional artists — the finest wheel ever built. Mechanism fully enclosed for safety and to exclude moisture and clay. Foot-controlled variable speed drive provides instant, smooth speed range of 30 to 150 rpm. Equipped with adjustable arm rests. Easy to operate — even for handicapped persons. Reversible 10" throwing head — back side recessed for casting plaster bats. Larger **18x18"** throwing table; wedging wire attached: removable water cup inside. Heavy bronze bearings pre-lubricated, sturdily built for long, dependable service. Use $\frac{1}{4}$ hp motor (not incl.). Shipped fully assembled—just mount wheel and motor on table or sheet of $\frac{3}{4}$" plywood. Self storing—tip up on edge. Wt. 45 lbs. List price $125. Factory special. **$64.50**

Factory Prices on Catalog Items

Send 10¢ for BIG 1953 catalog. Hundreds of bargains

MASTER SNOW BLOW SELF-PROPELLED

It's a lawn mower — It's a plow
It's a power sickle — It's a bulldozer
It's a cultivator — It's a rotary tiller

Tractor shown with Snow Blow Attachment

Item 206

Here at last is a power unit that **does everything** at a price that can't be matched. Built-in power takeoff to drive pumps, saws, generators, etc. Safety clutch — can't burn out. More versatile and efficient than tractors costing twice as much. Basic self propelled 2 hp tractor with Briggs or Clinton famous engine. Only.... **$119.50**

Snow Blow	**$29.50**	**Bulldozer**	**$11.25**
Rotary Tiller	**$42.50**	**Lawn Mower Hitch**	**$ 4.50**
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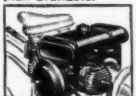
Freight prepaid to most areas. Easy payment plan available.

COMMANDO MOTOR BIKE



"The Winged Wheel with the Magic Feel"

New, super-modern 1953 Model. This job is the Cadillac of all motor bikes. Sensational automatic drive permits idling or infinite speed range, merely through use of throttle. Engine drives on rear wheel through Dynarotor—no belts or chains. Free wheeling control permits pedalling if desired. Perfect balance and comfort. Mounted on famous Schwinn bike, America's finest. Sturdy, dependable, easy starting, light weight engine provides surging power, up to 150 miles per gal. Plenty fast, too. Fully guaranteed. Wonderful for vacation trips . . . Use pedals for exercise and motor for speed and distance. Ride one to work and save. Men's or Women's models.

Commando Captain, 1 Cyl.—$1\frac{1}{2}$ hp., with elec. headlite, item 90B... **$199.50**

Commando General, 2 Cyl.—3 hp., with elec. headlite, item 91B... **$249.50**

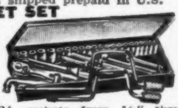
Commando Motor only, with complete mounting kit and instructions (can easily be installed on any bike in an hour).

1 cyl., item 90................. **$125.00**

2 cyl., item 91................. **$149.50**

All Commandos shipped prepaid in U.S.

32 pc. SOCKET SET



32-pc. Socket Set (Item 59) Highest quality guar. non-breakable sockets made by Husky. **Beautiful,** matched chrome alloy, absolutely the best. Complete range of 21 sockets from $\frac{1}{4}$" thru 7/16" in $\frac{1}{4}$" drive and 7/16" thru 1-1/16" in $\frac{1}{2}$" drive: 2 extensions, reversible $\frac{1}{2}$" ratchet, adaptor bit, slide head, all angle coupling, 2 end wrenches, $\frac{1}{4}$" speeder handle and sturdy metal tool box. For prof. mechanics who want the best. Wt. 14 lbs. **Easily worth** $41.50. While they last. **$16.95**

45 pc. SOCKET SET

(Item 205) Contains a complete set of sockets in $\frac{1}{2}$" drive, $\frac{3}{8}$" drive and $\frac{1}{4}$" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautiful matched chromed thin wall alloy sockets in a sturdy handsome steel tool box. Wt. 17 lbs. List Price $62.90. Factory Special.. **$26.95**

$\frac{3}{8}$" DRIVE 15 Pc. SOCKET SET

(Item 201) Same top qual. as above—includes 7 sockets $\frac{3}{8}$" thru $\frac{3}{4}$", reversible ratchet, extension, flex. handle, cross bar, 3 punches, metal tool box. Wt. 5 lbs. List Price $18.96. Our Spec....... **$9.95**

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(Item 208) Heavy duty, precision built, smooth, positive acting with built-in relief valve. Hi-Lift with screw extensions. Govt. surplus at a fraction of orig. cost. (Handle included.)

$1\frac{1}{2}$ ton (Item 208) Wt. 11 lbs............. **$6.45**

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(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor. 110-120 v. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lb. **$6.35; 9" Fan,** wt. 6 lbs. **$7.45;** 10" Fan, wt. 7 lb. **$8.45;** 12" Fan, wt. 8 lbs. **$9.45.**

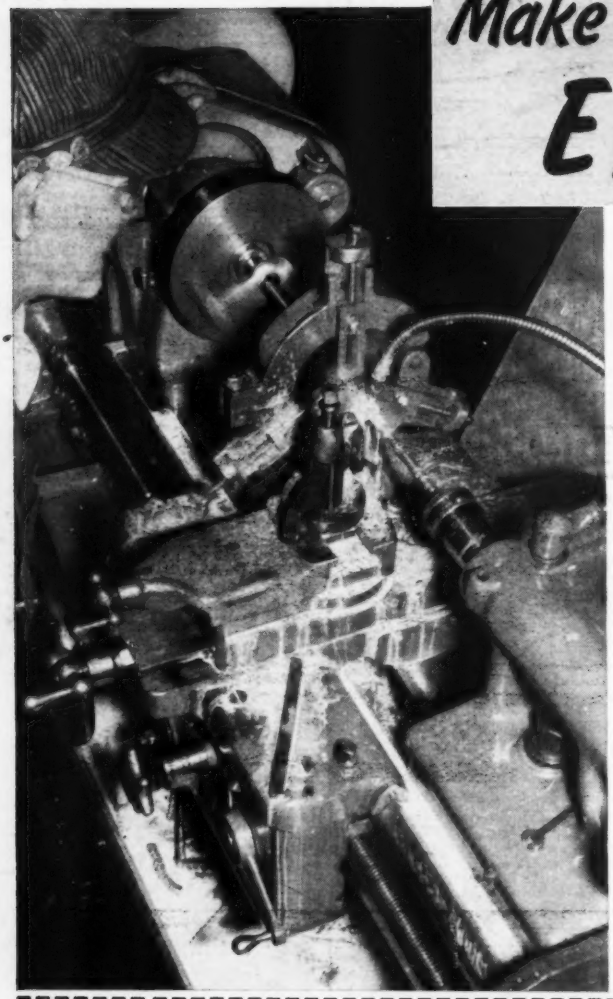
Heavy-duty 12" fan, enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, and other difficult applications. Wt. 12 lbs. Item 10D................ **$12.95**

All items brand new. Prices f.o.b. Chicago area. 10 day Money back guarantee. Send check or M.O.

MASTER MECHANIC MFG. CO., DEPT. 8B, Burlington, Wis.

SOUTH BEND 14½" LATHES

Make Tough Jobs EASY



When tolerances start slowing up output, then is the time you need South Bend 14½" Lathes. Many plants have found they can save manhours and material by running the tough operations on these precision lathes — this is the type of work they do best. Their versatility enables you to keep them busy on a wide variety of work with a minimum of set-up time. Many attachments are available for special classes of work. Find out now how these lathes can give you efficient machining — *mail the coupon below today.*

SPECIFICATIONS

SWING: 14⅝" over bed and saddle wings; 10¼" over saddle with chip guard removed.

BED LENGTHS: 5, 6, 7 and 8 feet.

DISTANCE BETWEEN CENTERS: 24⅛ to 60⅛ inches.

COLLET CAPACITY: 1 inch.

SPINDLE BORE: 1⅜ inches.

SPINDLE SPEEDS: Eight . . . 30 to 875 r.p.m.

POWER LONGITUDINAL FEEDS: 48 R.H. or L.H., .0015" to .0841".

POWER CROSS FEEDS: 48, .0006" to .0315".

THREAD CUTTING: 48 R.H. or L.H. pitches, 4 to 224 per inch.

CROSS SLIDE TRAVEL: 10 inches.

SEND INFORMATION CHECKED:

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☐ 9" and 10" BENCH LATHES

☐ 10" to 16-24" FLOOR LATHES

☐ ½" and 1" Collet TURRET LATHES

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Many students make $5, $10 a week and more EXTRA fixing neighbors' Radios in spare time while learning. The day you enroll I start sending you SPECIAL BOOKLETS that show you how. Tester you build with kits I send helps you make extra money servicing sets, gives PRACTICAL EXPERIENCE on circuits common to Radio and Television. All equipment is yours to keep. Send postage-free card today for Actual Lesson and 64-page Book.

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What will you be doing one year from today . . . will you be on your way toward a good job or a business of your own in Radio-Television? NRI Courses lead to these and many other jobs: Radio and TV servicing, P.A., Auto Radio, Lab, Factory and Electronic Controls Technicians, Radio and TV Broadcasting, Police, Ship and Airways Operators and Technicians. The United States has over 105 million home and auto Radios—over 2,900 Broadcasting Stations. Radio is growing, more expansion is on the way.

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Think of the opportunities in Television. It now reaches from coast to coast with over 15,000,000 TV sets now in use; 108 TV stations operating. This means good pay jobs with bright futures for operators, installation and service technicians. Now is the time to get ready for a successful future. My lessons cover both Radio and Television principles and equipment I furnish gives you practice on circuits common to both Radio and Television.

Television is Today's Good Job Maker

Over 1800 additional Television stations have been authorized with many expecting to be operating in 1953. That will cause the sale and servicing of sets to boom in areas where there is no television now. All this spells opportunity, good pay, progress if you act to prepare yourself now. Qualified Radio-Television technicians are making unusually good money. Now the demand will increase; the field is growing.

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With both my Communications Course and my Servicing Course I send you many kits of parts you use to build equipment for practical experience. They "bring to life" my easy-to-understand, illustrated lessons. Shown here are just a few pieces of equipment you build. You use them to make many tests, experiment with circuits common to both Radio and Television. Read about and see photos of other equipment in my FREE 64-page Book. All equipment is yours to keep! Mail card now. No Postage Needed.

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MAIL CARD NOW!

Send the postage-free card now for my FREE DOUBLE OFFER. You get Actual Servicing Lesson. Also my 64-page book, "How to Be a Success in Radio-Television." Read what my graduates are doing, earning; see equipment you practice with at home. Mail card now. J. E. SMITH, Pres., National Radio Inst., Washington 9, D. C. Our 39th year.

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Time for VISION

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New Has Own Shop. "Got laid off my machine shop job which was best thing that ever happened to me as I opened a full time Radio shop."—Ernest T. Slate, Corsicana, Texas.

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Many NRI trained men start their own business with capital earned in spare time. Let me show you how you can be your own boss. Robert Dohmen, New Prague, Minn., shown at left, says, "Am now tied in with two television outfits and do warranty work for dealers. Often fall back to NRI textbooks."

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See Inside

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BROADCASTING: Chief Technician, Chief Operator, Power Monitor, Recording Operator, Remote Control Operator. SERVICING: Home and Auto Radios, P.A. Systems, Television Receivers, Electronic Controls, FM Radios. IN RADIO PLANTS: Design Assistant, Service Manager, Tester, Serviceman. SHIP AND HARBOR RADIO: Chief Operator, Radiotelephone Operator. GOVERNMENT RADIO: Operator in Army, Navy, Marine Corps, Forestry Service Dispatcher. AVIATION RADIO: Transmitter Technician, Receiver Technician.

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$10 to $15 Week Spare Time. "Four months after enrolling, was able to service radios—averaged $10 to $15 week spare time. Now have full time business." — Wm. Weyde, Brooklyn, N. Y.

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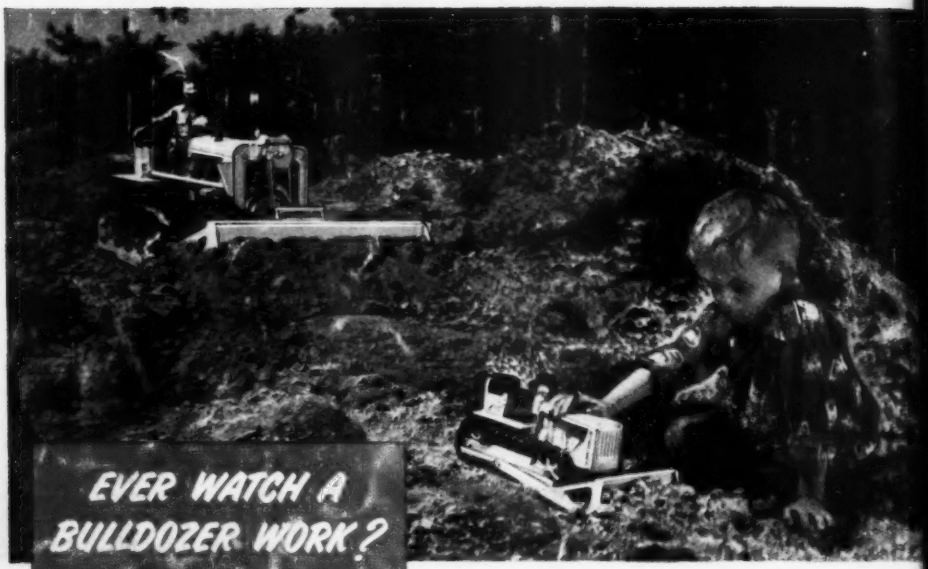
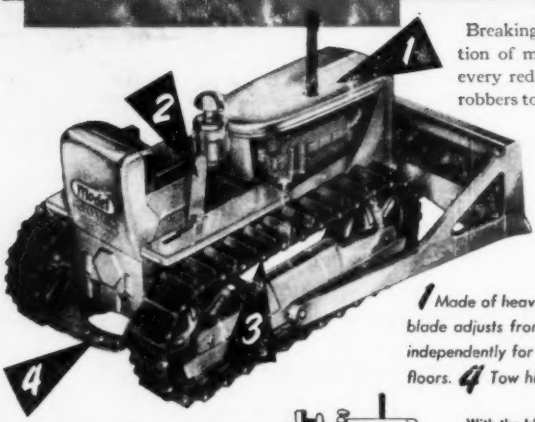


EVER WATCH A BULLDOZER WORK?



Breaking through earth, brush, trees, it's a demonstration of mechanized might that fires the imagination of every red-blooded boy, turns his interest from cops and robbers to the he-man activities of a construction engineer.

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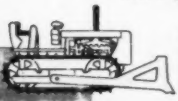
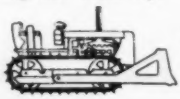
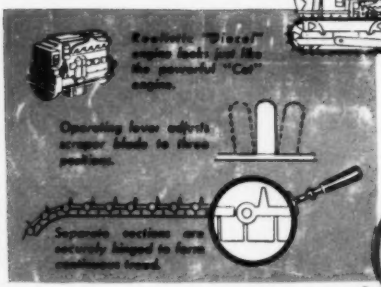
1 Made of heavy-gauge steel to outlast other toys 3 to 1. 2 Scraper blade adjusts from driver's seat. 3 Heavy-duty Tenite treads operate independently for sharp turns, dig into rough ground, yet will not scratch floors. 4 Tow hitch for pulling other Model Toys.



With the blade lowered, bulldozer levels roadways and airports.



With blade in up position, tractor used to tow other Model Toys.



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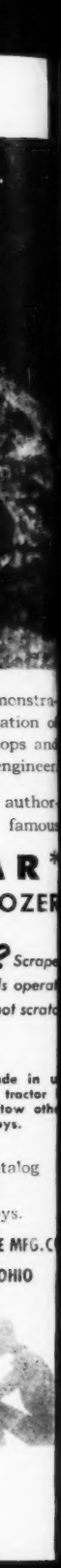
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